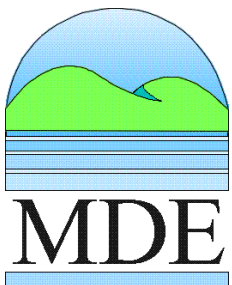# Baltimore Harbor and Back River Nutrients TMDLs

December 17, 2003

Stakeholders Advisory Group

MDE

Baltimore Harbor and Back River Modeling Framework

- Watershed Model - HSPF
  - MDE Model used Patapsco/Back
  - CBP Model used for Upper Bay

- Hydrodynamic Model - CH3D

- Water Quality Model - CE-QUAL-ICM

- Sediment Fluxes - Chesapeake Bay Sediment Flux Model

Review Update

- Reviewed by State Agencies, Baltimore County and Baltimore City

- Reviewed by Chesapeake Bay Program Modeling Subcommittee

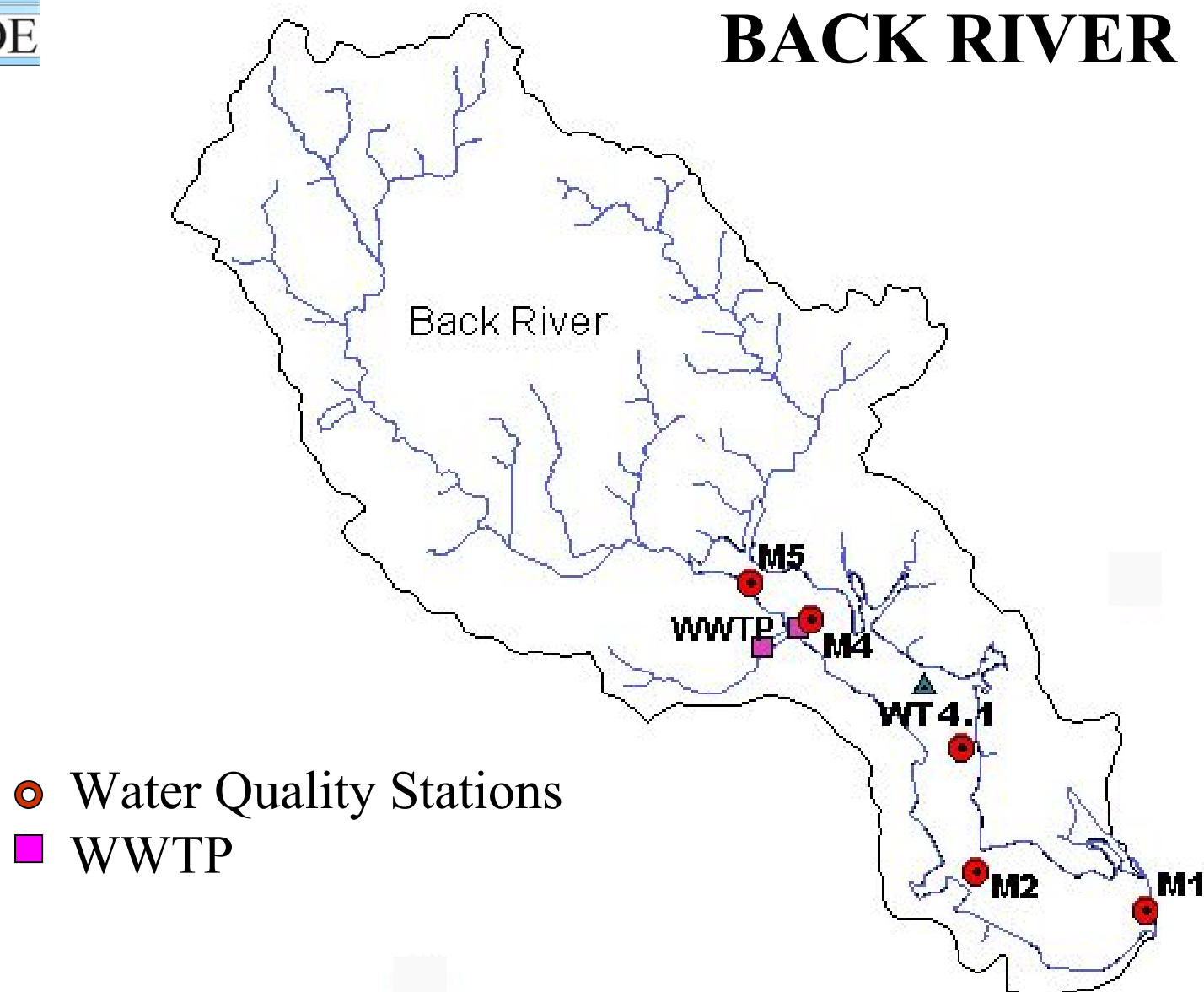- Reviewed by SAG Modeling Technical Group

Proposed Endpoints

- DO
  - Adapt CBP proposed Designated Uses and Criteria.

- Chlorophyll *a*
  - Adapt CBP proposed narrative Criteria
  - MDE Quantifying Interpretation of the Narrative Criteria: Chla < 50 µg/L.

Baltimore Harbor and Back River Proposed Quantifying Interpretation of CBP Chlorophyll *a* Narrative Criteria

- MDE will be adapting proposed CBP narrative Chla criteria to be implemented by existing Chla guidelines.

- Existing MDE Guidelines: Chla < 50 µg/L.

- Eutrophication model will be used to check Chla levels when DO reaches attainment.

- Using Chla rolling monthly average for attainment comparison.

Back River
Proposed Designated Uses and DO Endpoint

	Feb 1 – May 31	June 1 – Jan 31
Back River	**Migratory Fish**	**Open Water**

Designated Use	30-day mean	7-day mean	Instantaneous minimum
MF			5.0
OW	5.0	4.0	1.7

BACK RIVER   MDE CALIBRATION
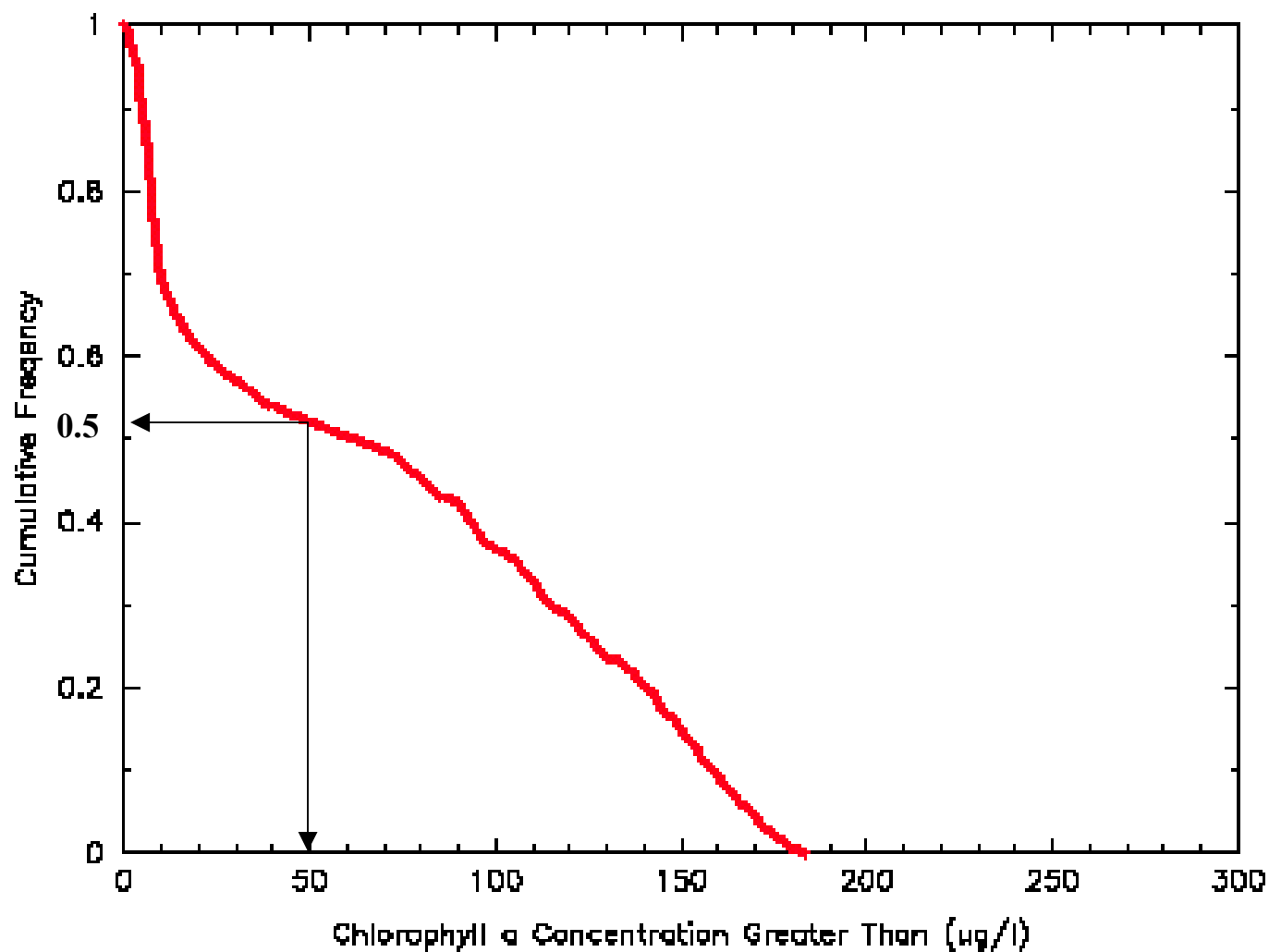**DO Time Series**
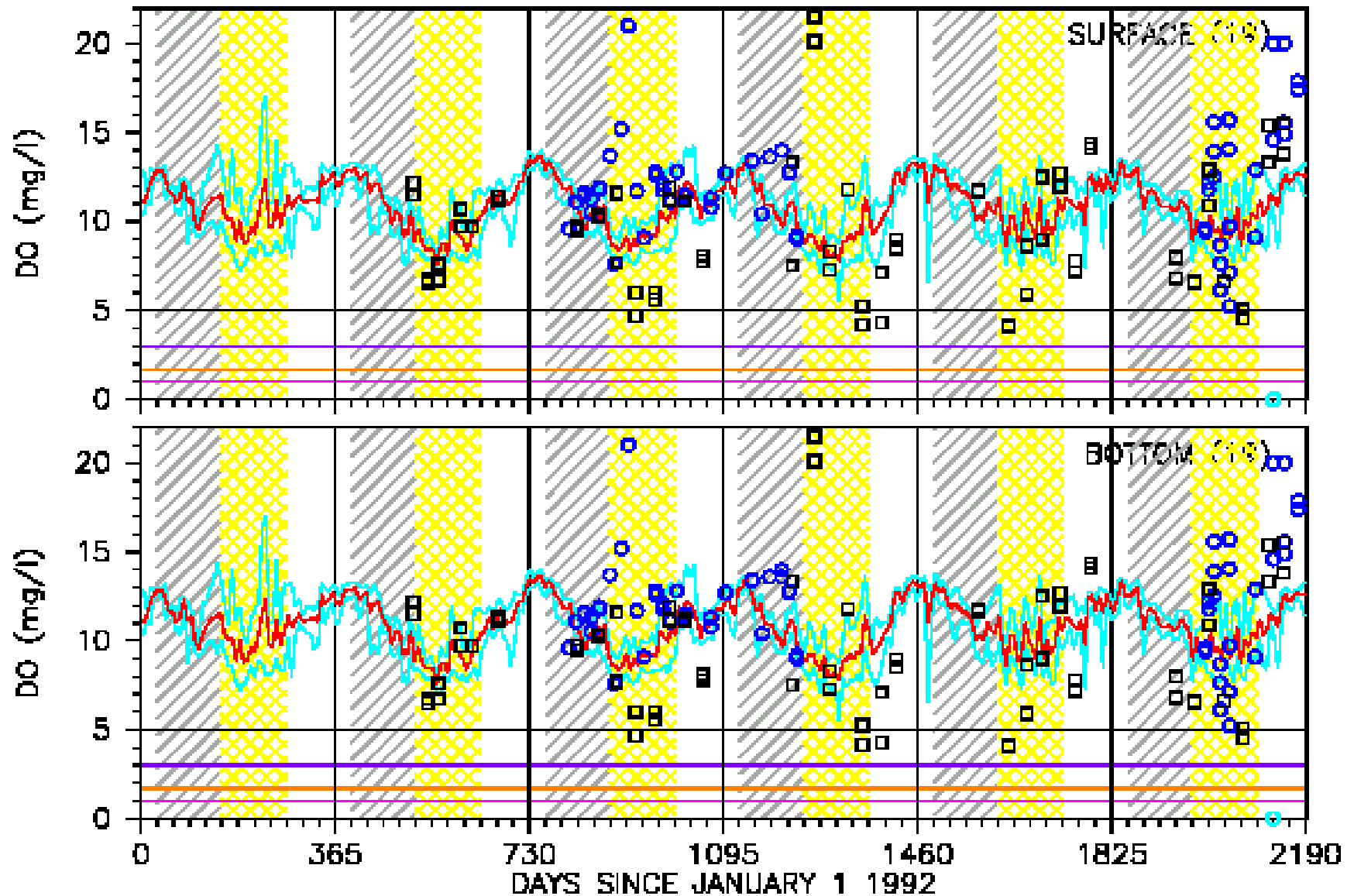
M05(BR1)

BACK RIVER MDE CALIBRATION
Station WT4.1
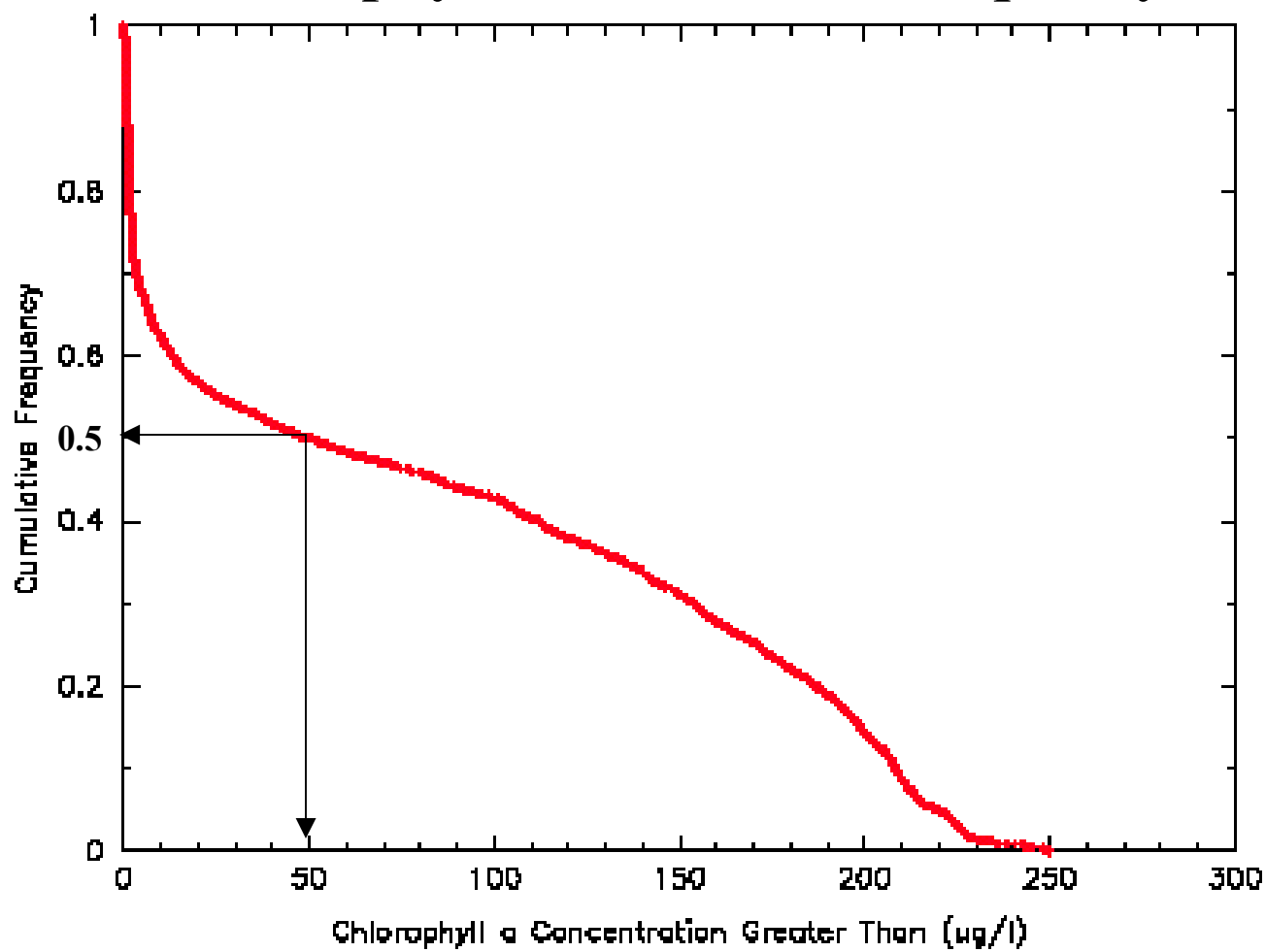## Chlorophyll *a* Cumulative Frequency

BACK RIVER MDE CALIBRATION
Station M04
Chlorophyll *a* Cumulative Frequency

BACK RIVER   MDE CALIBRATION
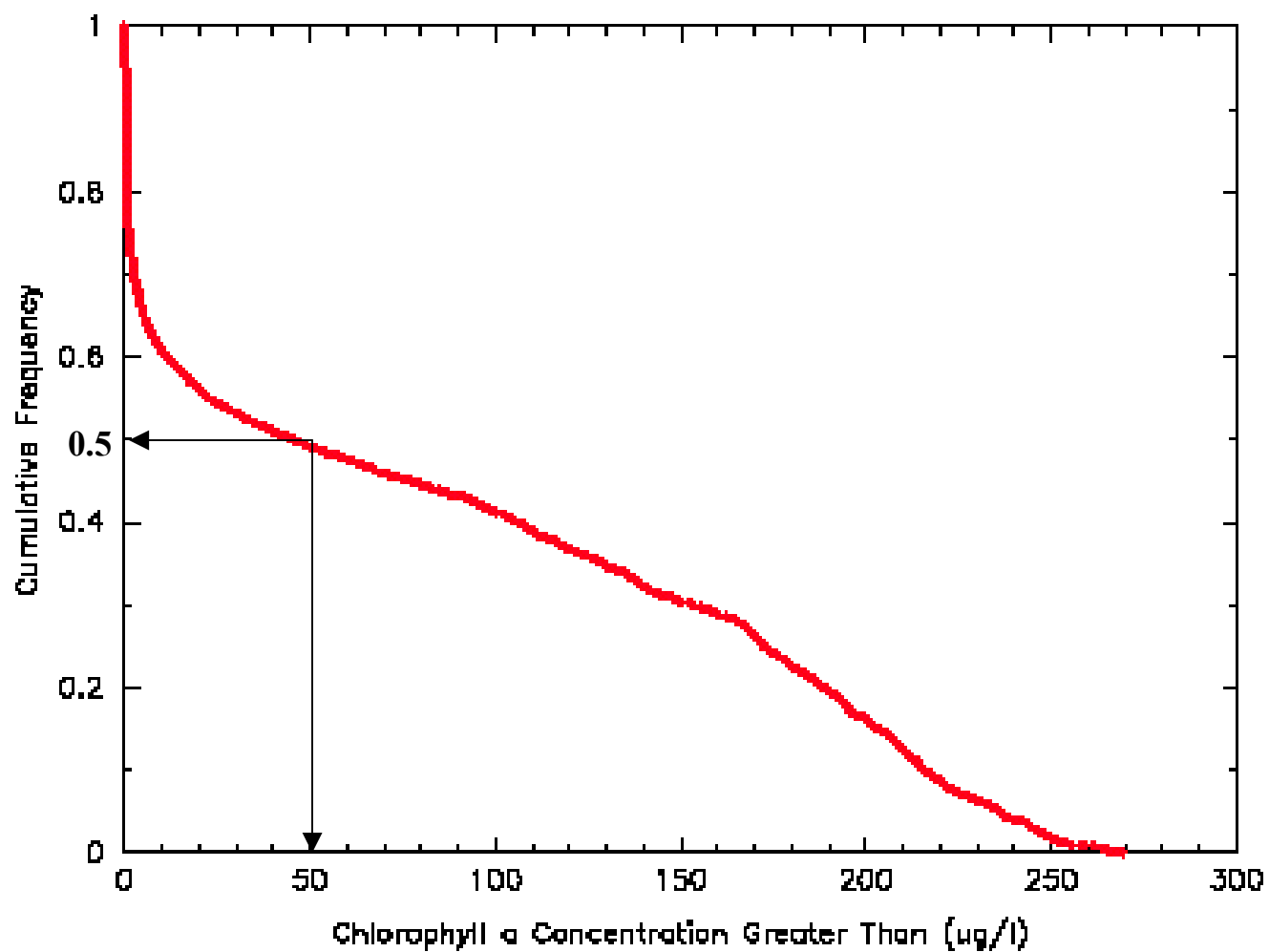
Station M05
Chlorophyll *a* Cumulative Frequency

BACK RIVER   MDE CALIBRATION

Station WT4.1
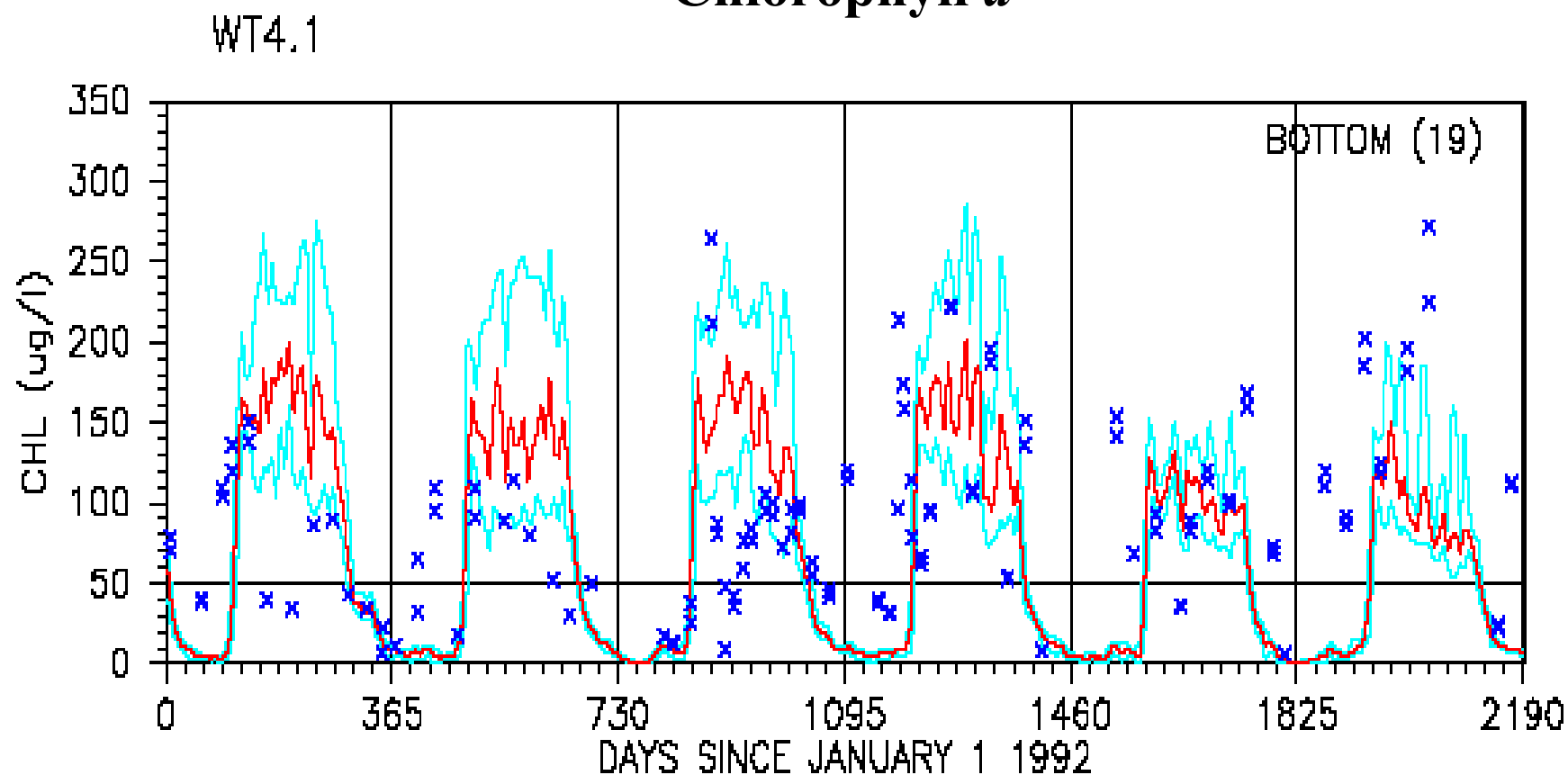
Chlorophyll *a*

BACK RIVER   MDE CALIBRATION

Station M04
Chlorophyll *a*

M04(BR2)

BOTTOM (19)

CHL (ug/l)

DAYS SINCE JANUARY 1 1992

BACK RIVER   MDE CALIBRATION

Station M05
Chlorophyll *a*

M05(BR1)

BOTTOM (19)

CHL (ug/l)

DAYS SINCE JANUARY 1 1992
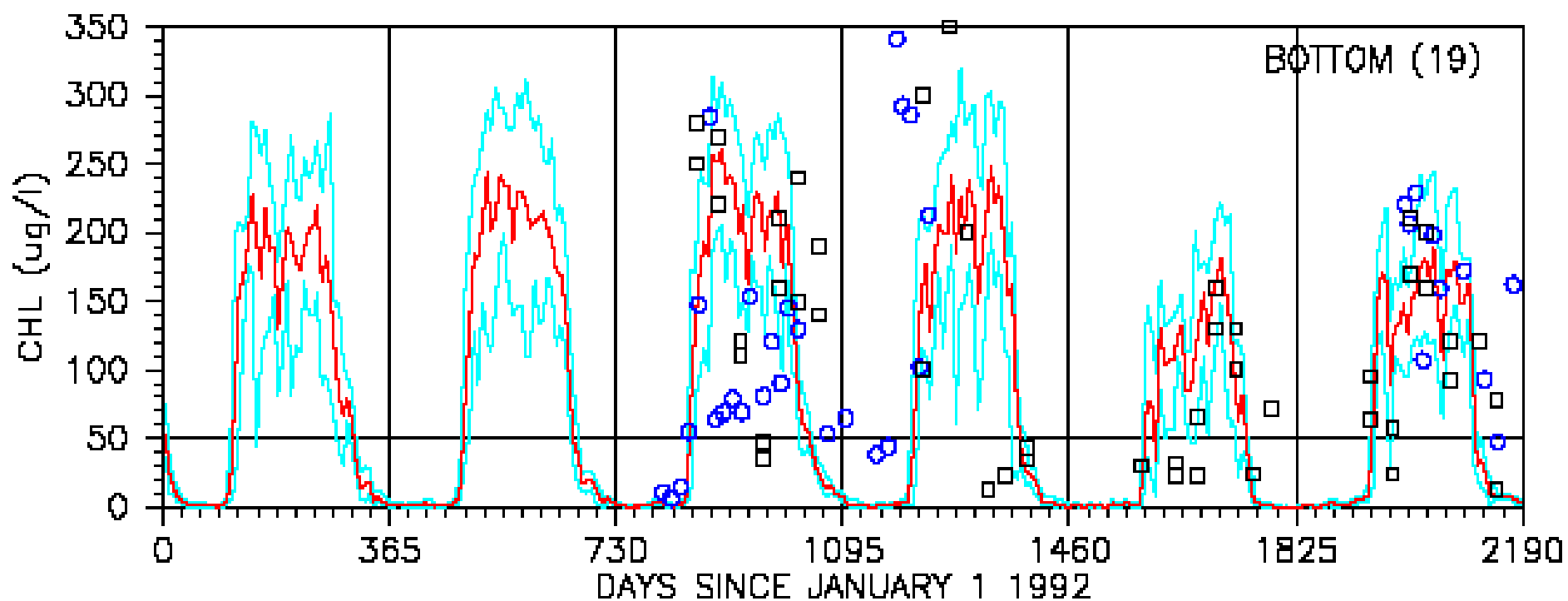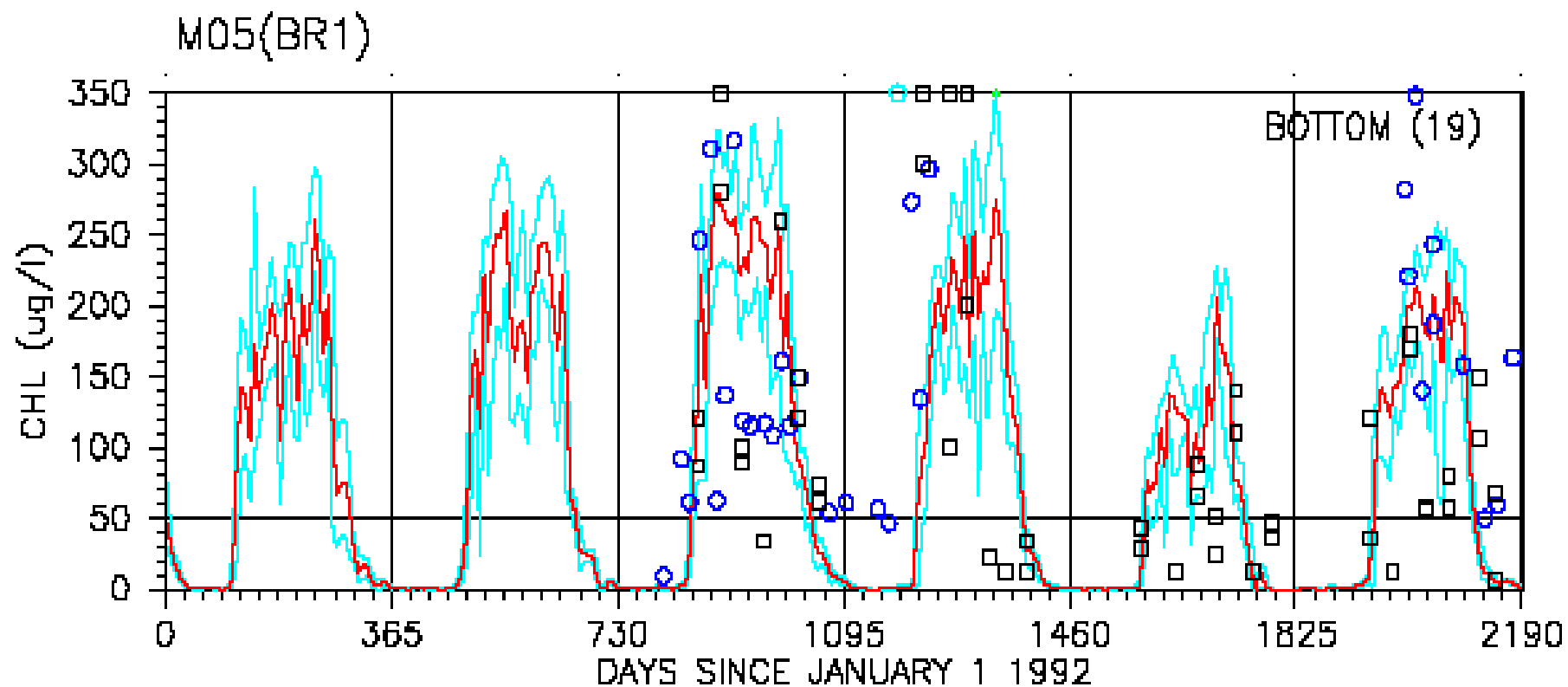
Impairment Summary

- Back River is impaired by high Chlorophyll a

- There is no DO impairment

BACK RIVER   CBP ALLOCATION

Station M04
Chlorophyll *a* Cumulative Frequency
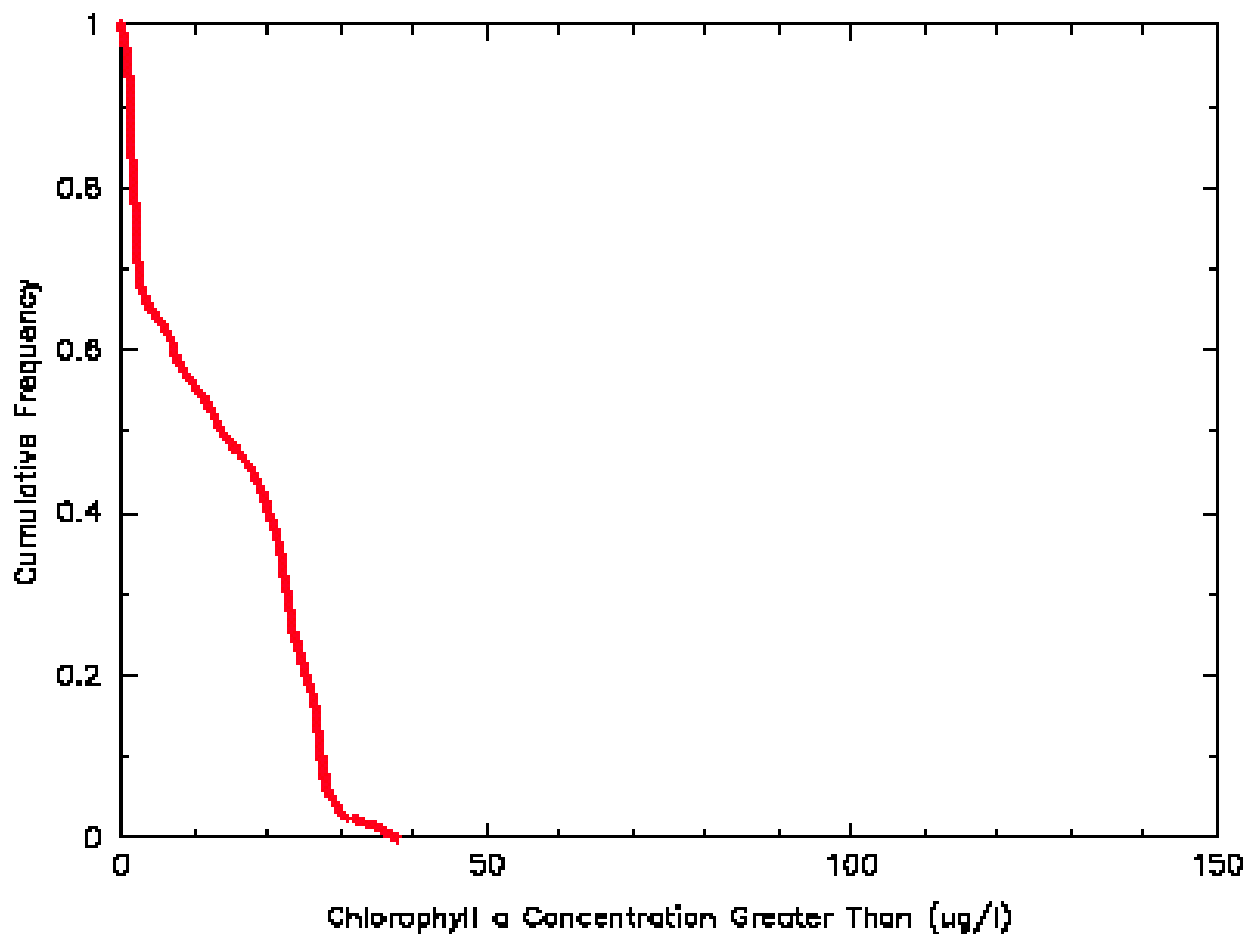
BACK RIVER   CBP ALLOCATION

Station M05
Chlorophyll *a* Cumulative Frequency
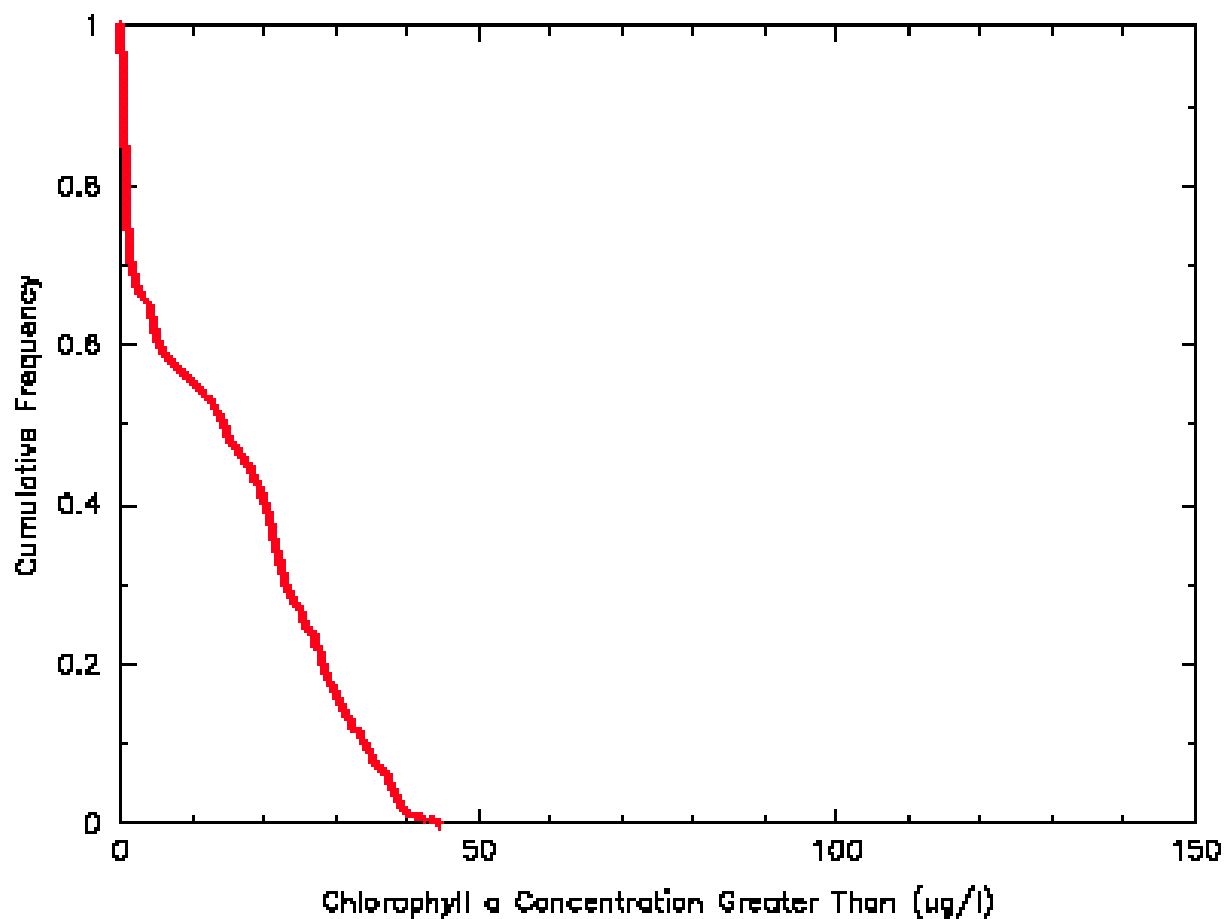
BACK RIVER   CBP ALLOCATION

Station WT4.1
Chlorophyll *a* Cumulative Frequency

BACK RIVER   CBP ALLOCATION

WT4.1

BOTTOM (19)

CHL (ug/l)

DAYS SINCE JANUARY 1 1992
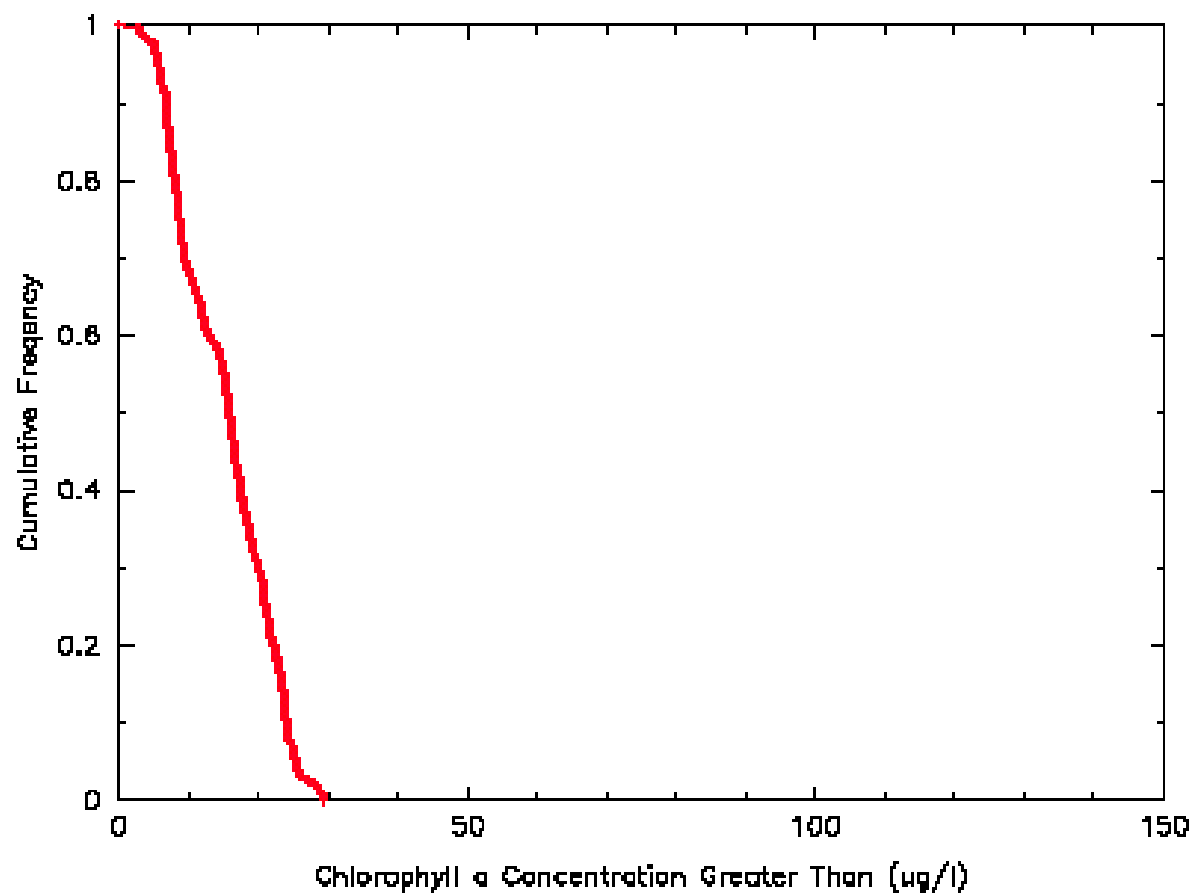
BACK RIVER   CBP ALLOCATION

BACK RIVER   CBP ALLOCATION

M05(BR1)

CHL (ug/l)

BOTTOM (19)

DAYS SINCE JANUARY 1 1992
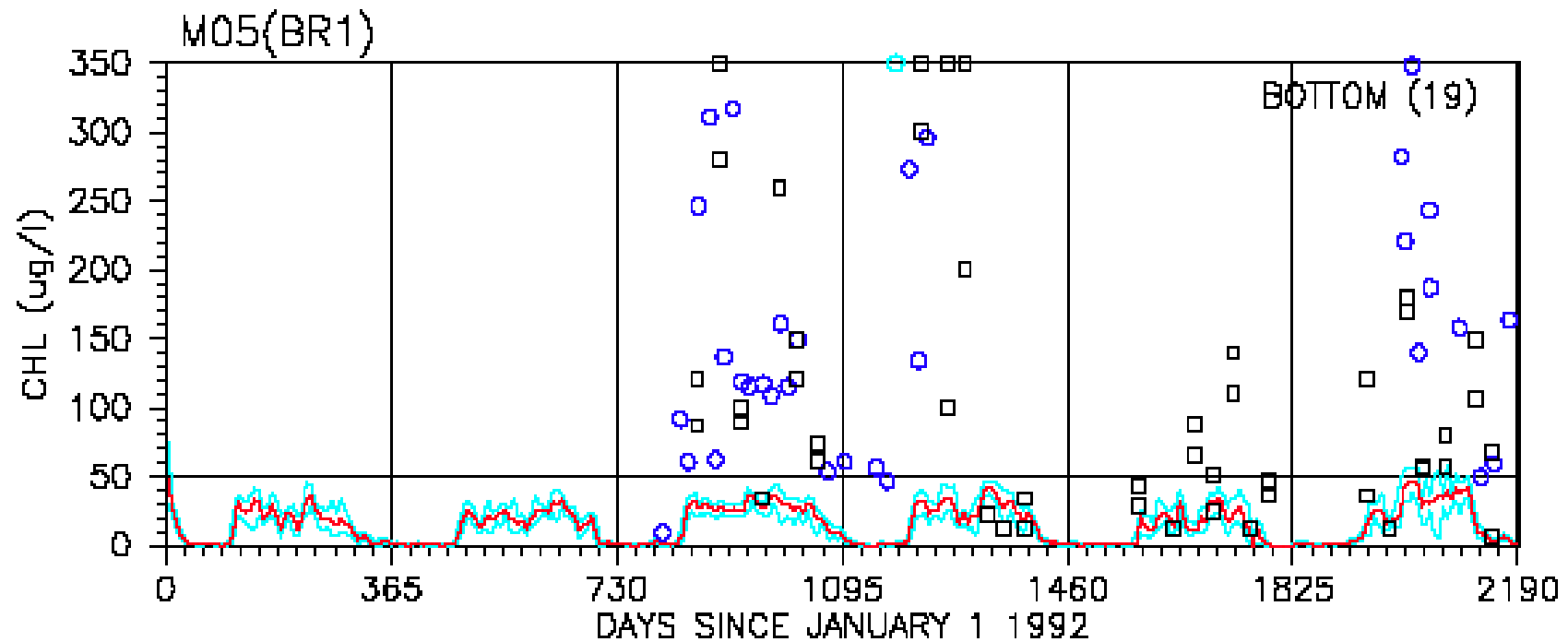
Back River Possible TMDL Scenario Run

- **Load**
  - **Point Source (Back River WWTP)**
    - **Flow: Maximum permit flow (130 MGD)**
    - **TN: 4 mg/l annual average**

      (3 mg/L in May - October, 5 mg/L in November - April)
    - **TP: 0.2 mg/l (current permit)**

  - **Nonpoint Source**
    - **MDE's HSPF model outputs x Pass Through Efficiency**
    - **Pass Through Efficiency = CBP allocation/CBP calibration**

      TN = 0.33   TP = 0.33

Back River
TMDL Scenario Run
Station WT4.1 Chlorophyll *a* Cumulative Frequency
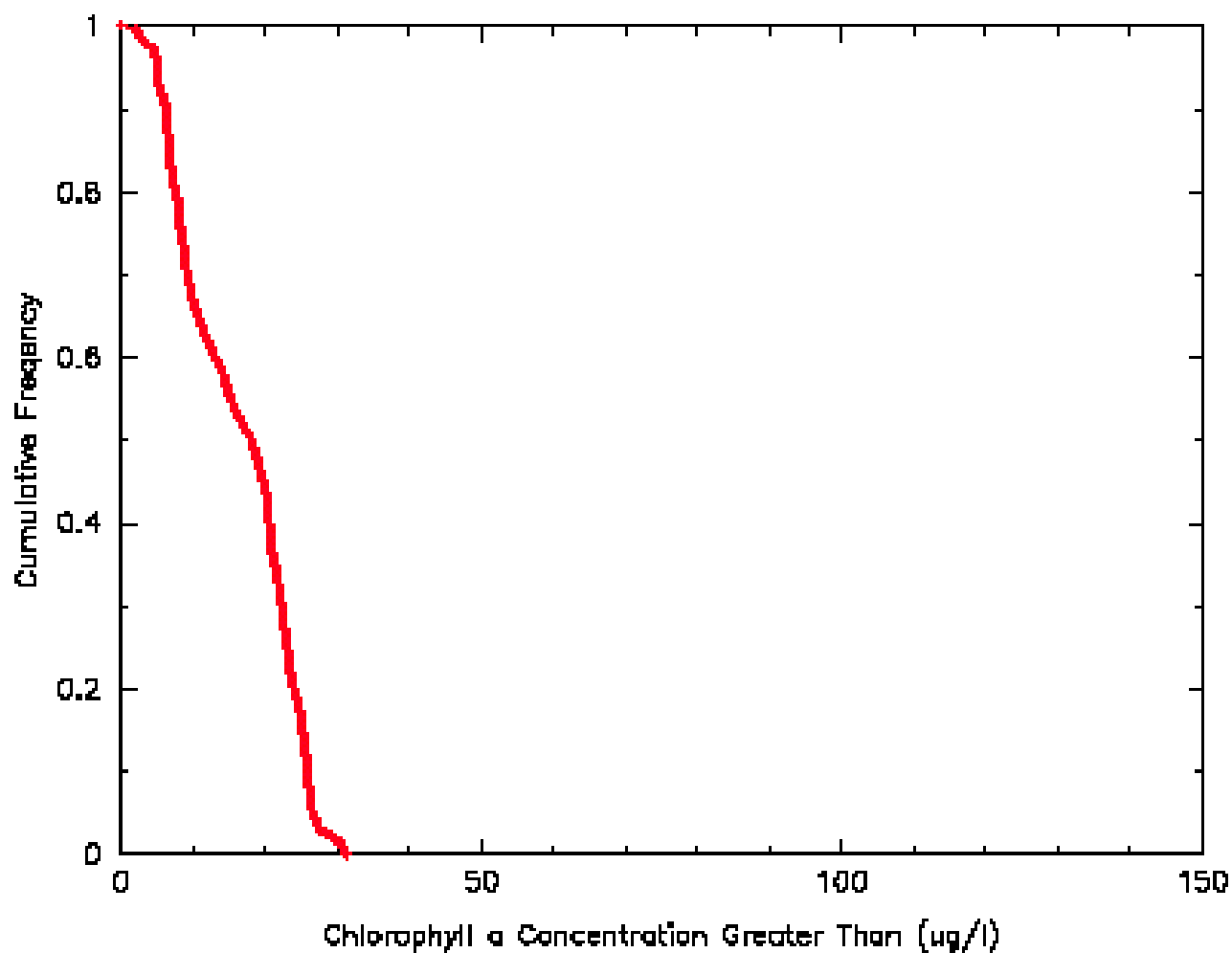
Back River
TMDL Scenario Run
Station M04 Chlorophyll *a* Cumulative Frequency
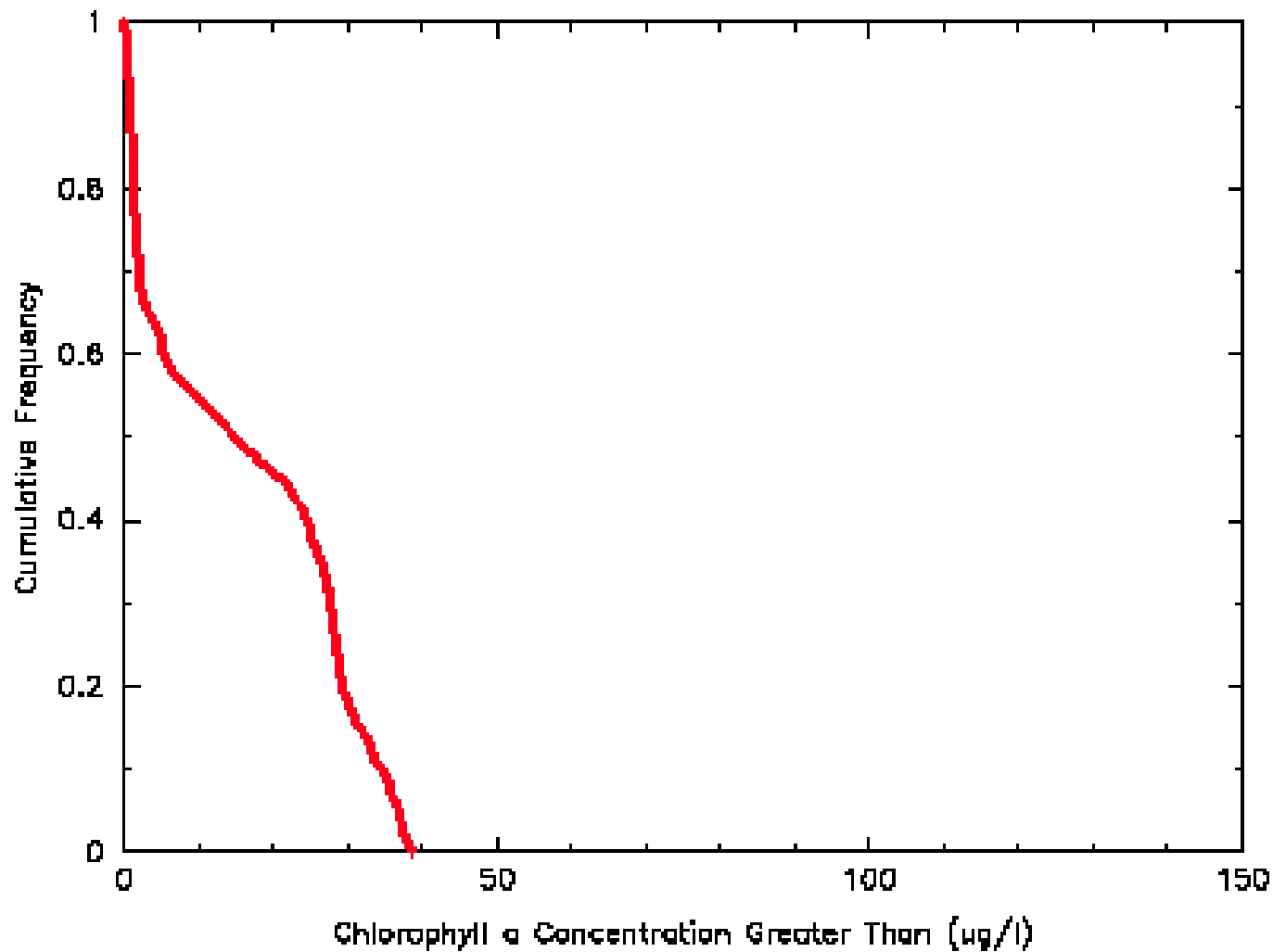
Back River
TMDL Scenario Run
Station M05 Chlorophyll *a* Cumulative Frequency
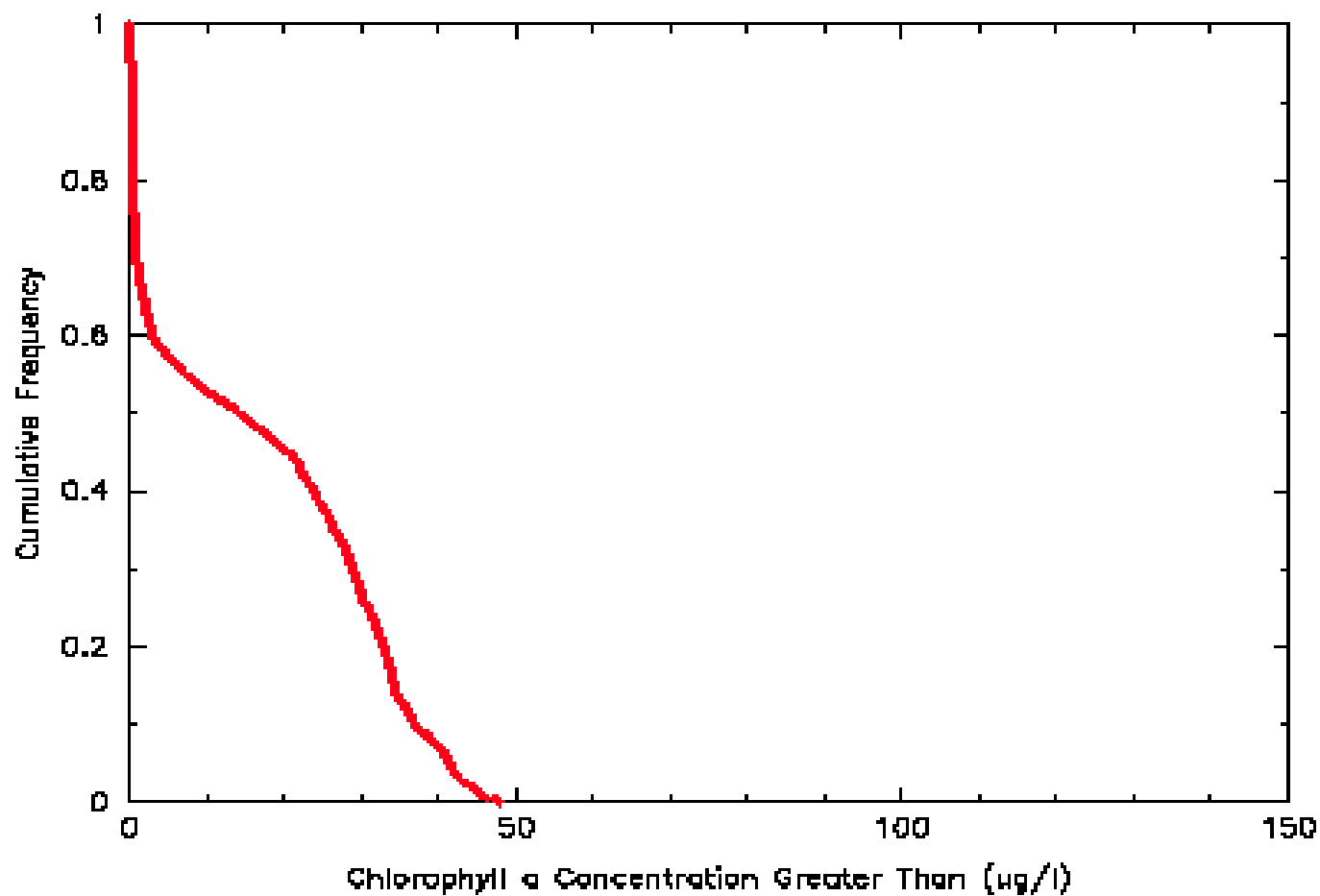
Back River
TMDL Scenario Run
Station WT4.1 Chlorophyll *a* Time Series
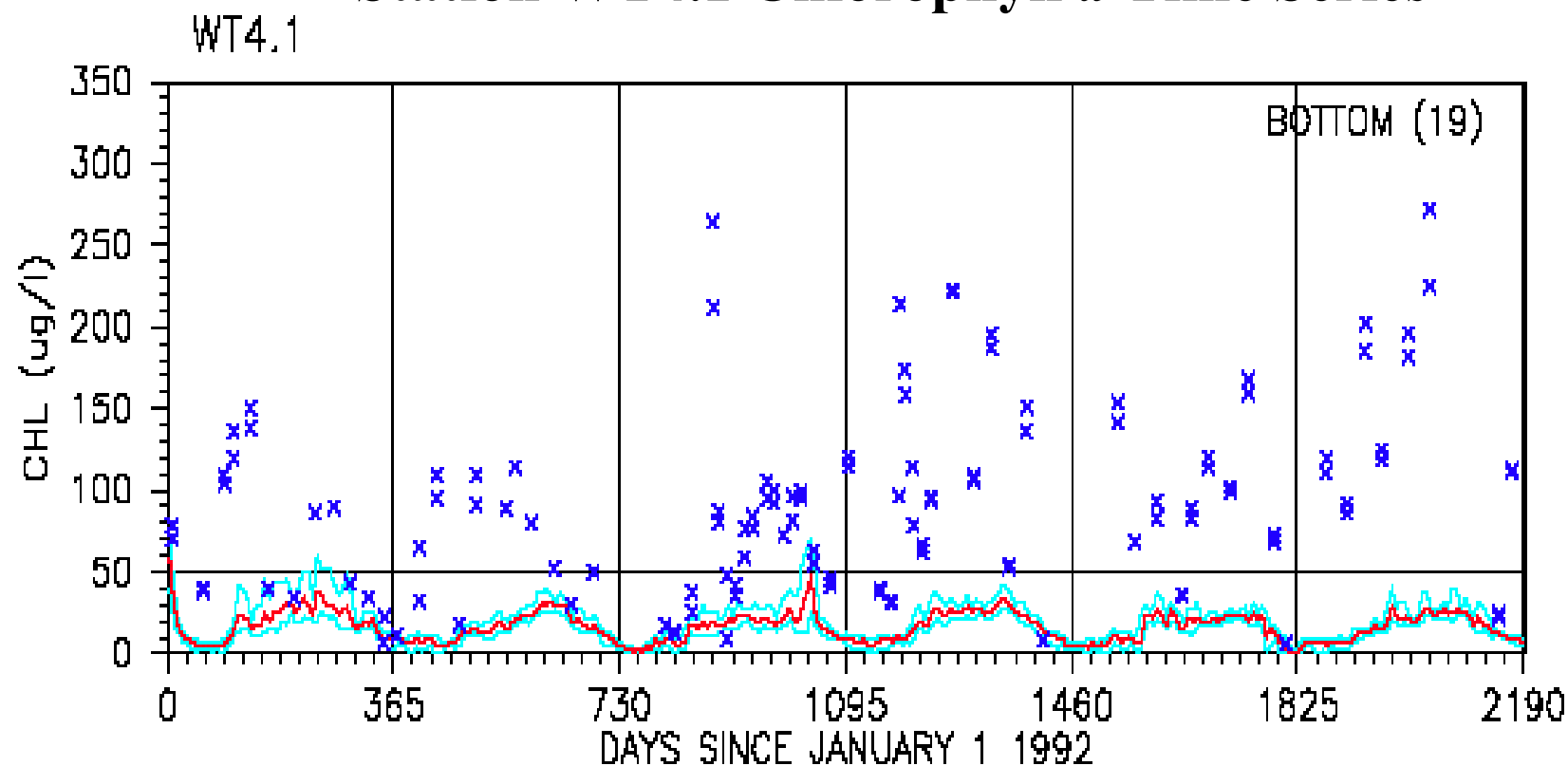
Back River
TMDL Scenario Run
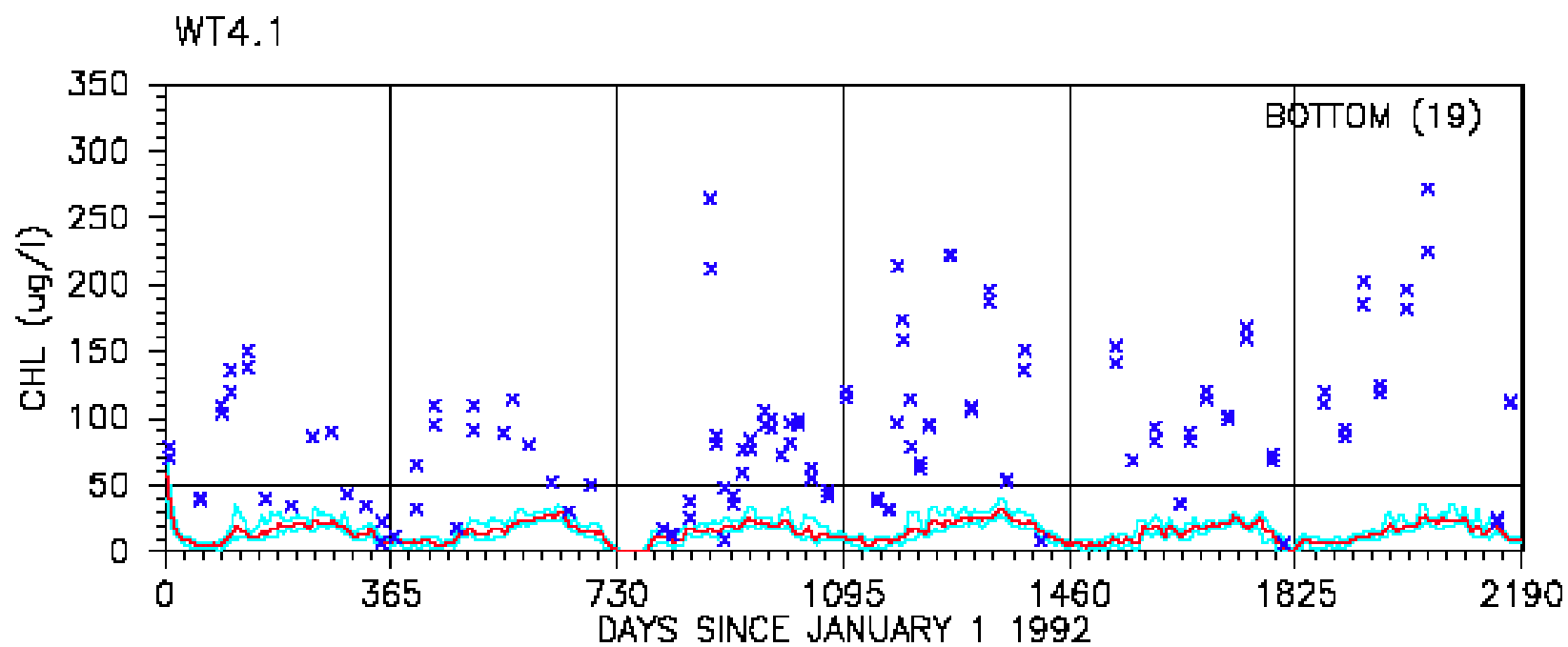## Station M04 Chlorophyll *a* Time Series
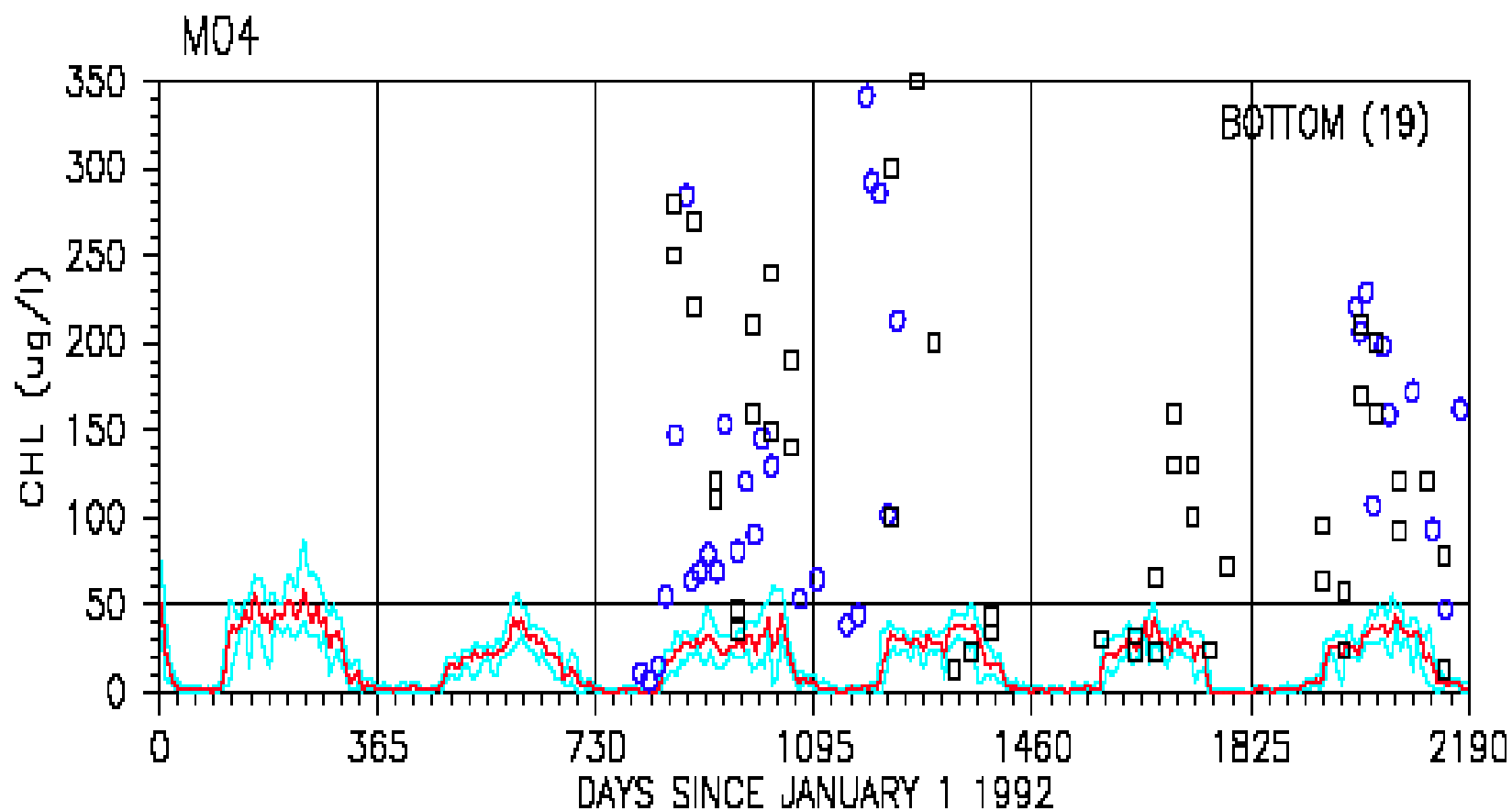
Back River
TMDL Scenario Run
Station M05 Chlorophyll *a* Time Series
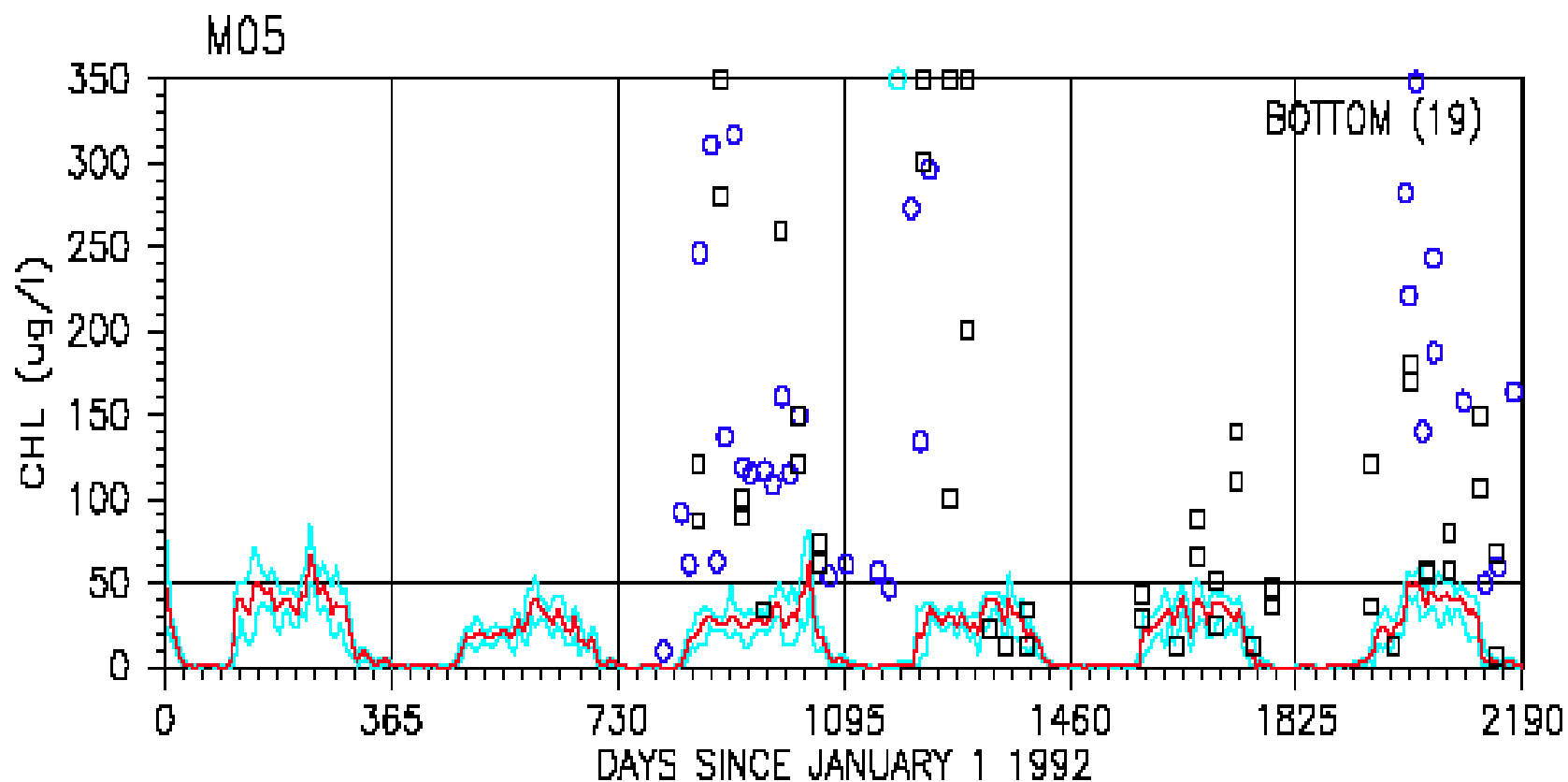
Summary
Back River Possible TMDL Scenario Run

SCENARIOS	PS TN (lb/day)	PS TP (lb/day)	NPS TN (lb/day)	NPS TP (lb/day)
TMDL Scenario Run	4339 (TN = 3 mg/l for May to Oct and 5 Mg/l for the rest; Flow = 130 MGD)	220 (TP = 0.2 mg/l; Flow = 130 MGD)	423	37

Water Quality

- Chlorophyll *a:* below the goal of 50 ug/l in all stations

- DO: always above the criteria goal for all 5 stations.

BALTIMORE HARBOR

DESIGNATED USES
BY WQ STATION

S - I, II, II
B - I, II, II
M5

S - I, II, II
B - I, II, II
WT4.1

S - I, II, II
M28 B - I, III, II

S - I, II, II
B - I, II, II
M4

M27
S - I, II, II
B - I, II, II

M26

S - I, II, II
B - I, II, II

S - I, II, II
B - I, II, II
M2

S - I, II, II
B - I, II, II
M1

S - I, II, II
B - I, II, II

M25 S - I, II, II
B - I, II, II

M21

M20

S - I, II, II
B - I, II, II

M18

M19

M22

M17

S - I, II, II
B - I, II, II
M12

S - I, II, II
B - I, II, II

S - I, II, II
B - I, III, II
M23

S - I, II, II
B - I, III, II
M16

WT5.1

M10
S - I, II, II
Only one layer

S - I, II, II
B - I, IV, III

M11
S - I, II, II
B - I, II, II
M9

M15

M8 S - I, II, II
B - I, II, III

S - I, II, II
B - I, II, II
M24

M7

M14

M13

M6 S - I, II, II
B - I, II, II

S - I, II, II
B - I, II, II

S - I, II, II
B - I, II, II

- WQ Station
S – Surface Layer
B – Bottom Layer
I – Migratory Fish Spawning
   and Nursery Use
II – Open-Water Fish
   and Shellfish Use
III - Deep Water
IV – Deep Channel

Harbor Designated Uses

Legend:
- Mdeloc_edit_fttomtr_md.shp
- Boynton_bf_fttomtr_md.shp
- Grid091002_all_prj.shp
  - open water
  - deep water
  - deep channel

Baltimore Harbor
Proposed Designated Uses and DO Endpoint

	Feb 1 –May 31	June 1 –Sept 30	Oct 1 –Jan 30
0 – Upper Pycnocline	Migratory Fish (MF)	Open Water (OW)	Open Water (OW)
Upper – Lower pycnocline	Migratory Fish (MF)	Deep Water (DW)	Open Water (OW)
Lower Pycnocline - Bottom	Migratory Fish (MF)	Deep Channel (DC)	Open Water (OW)

Designated Use	30-day mean	7-day mean	1-day mean	Instantaneous minimum
MF				5.0
OW	5.0	4.0		3.0
DW	3.0		2.3	1.7
DC				1.0

MDE CALIBRATION

DEEP WATER (JUNE—SEPT)
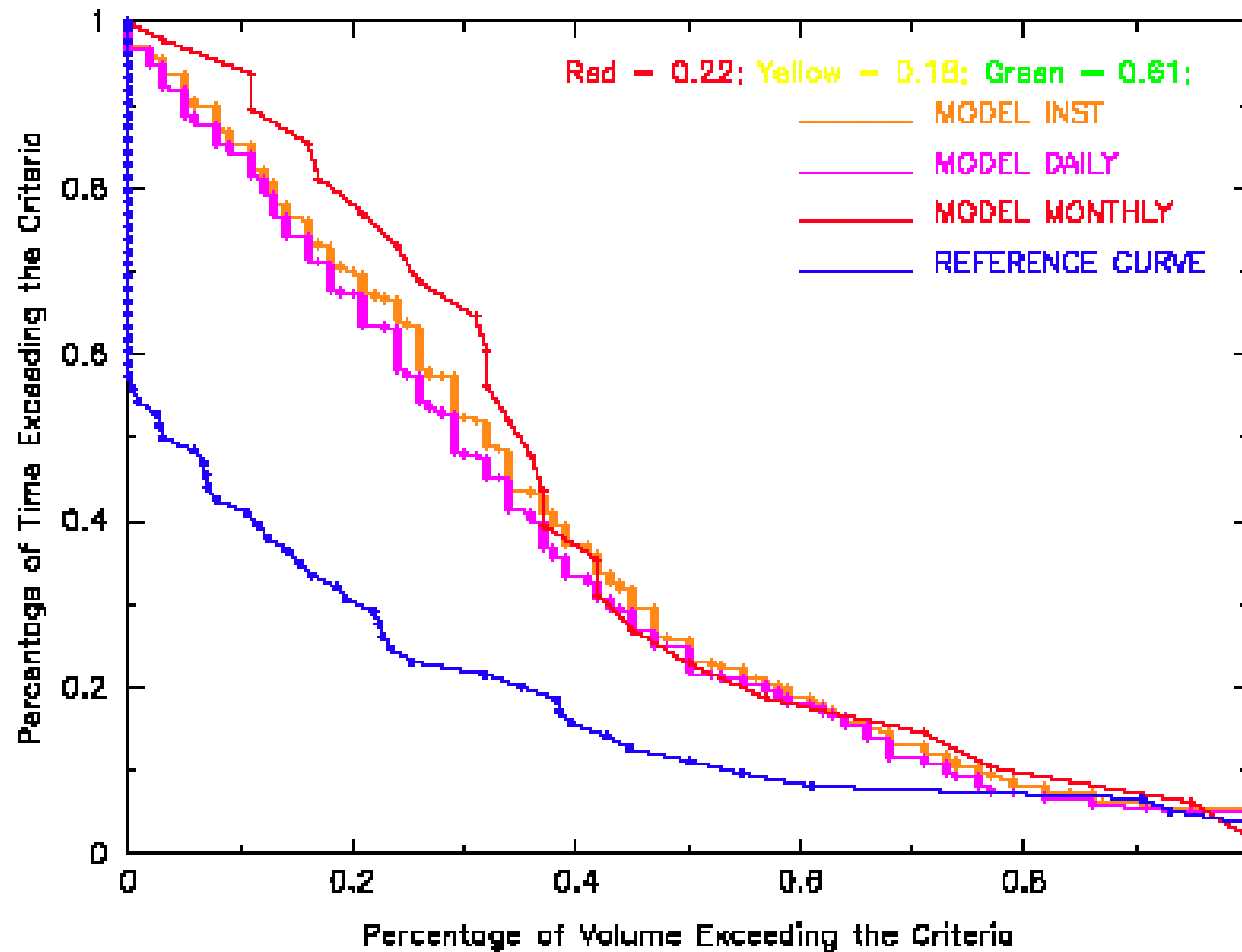
MDE CALIBRATION

MI(FEB—MAY)
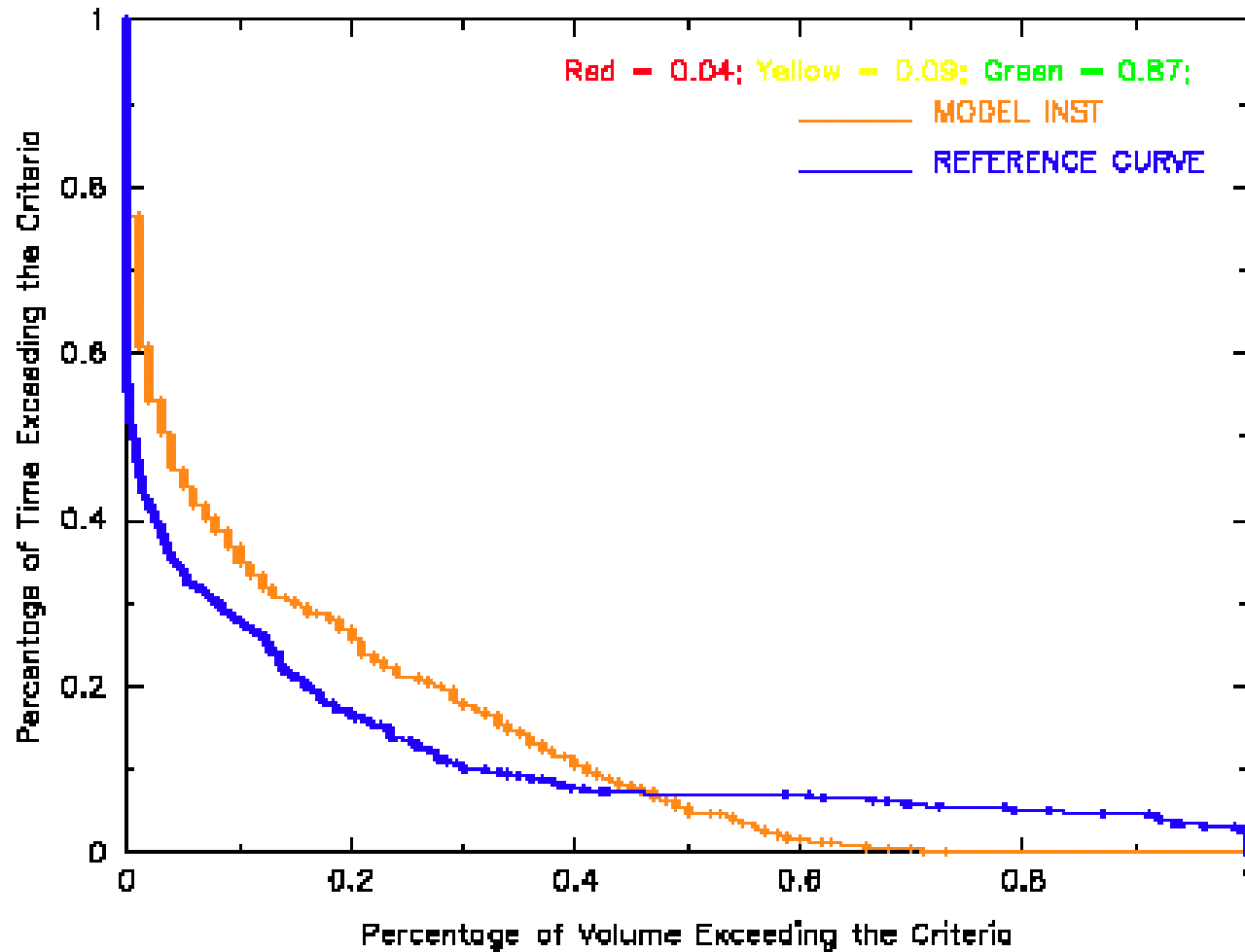
MDE CALIBRATION

OPEN WATER (JUNE-SEPT)
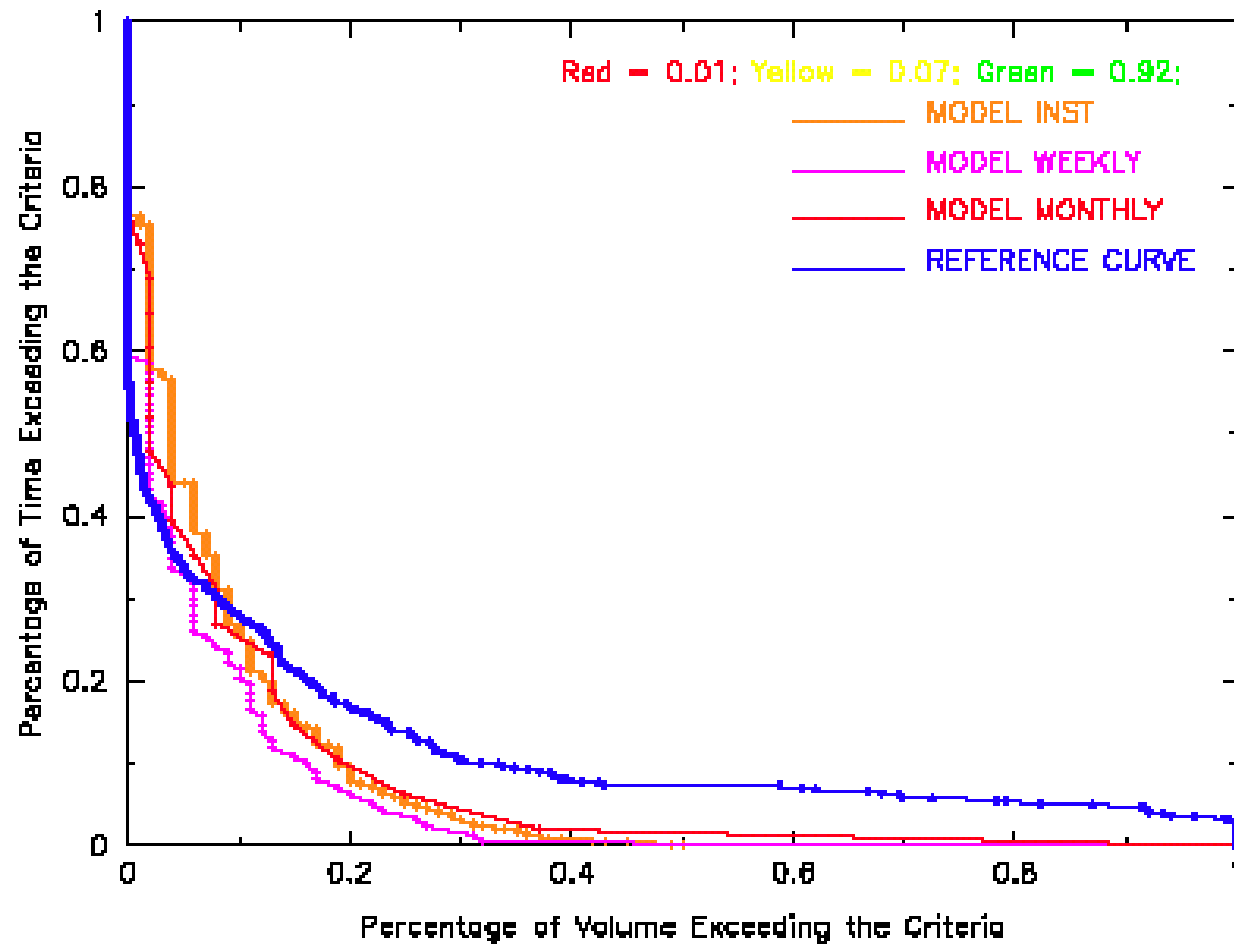
MDE CALIBRATION

OPEN WATER (OCT-JAN)
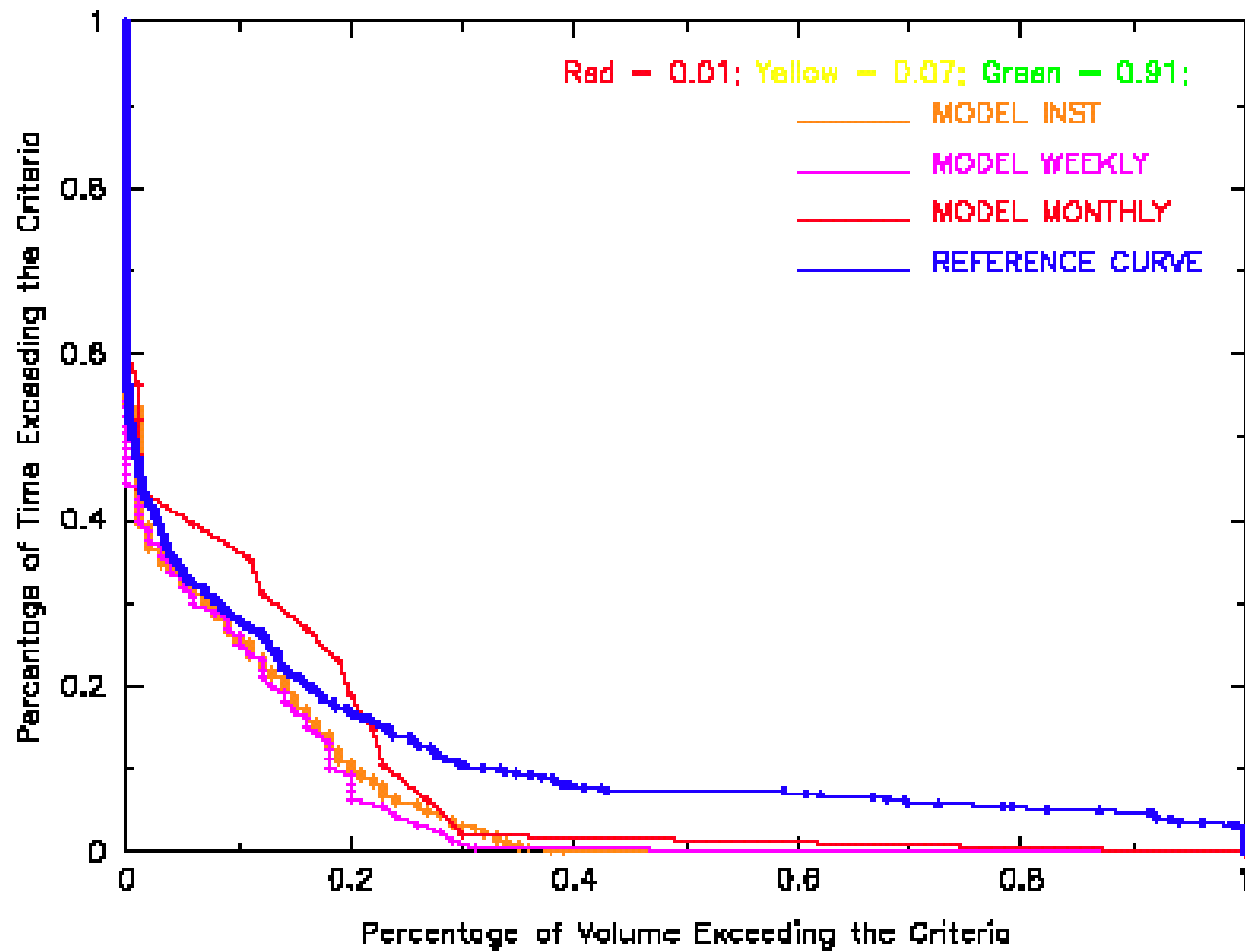
SURFACE DO ATTAINMENT MAP
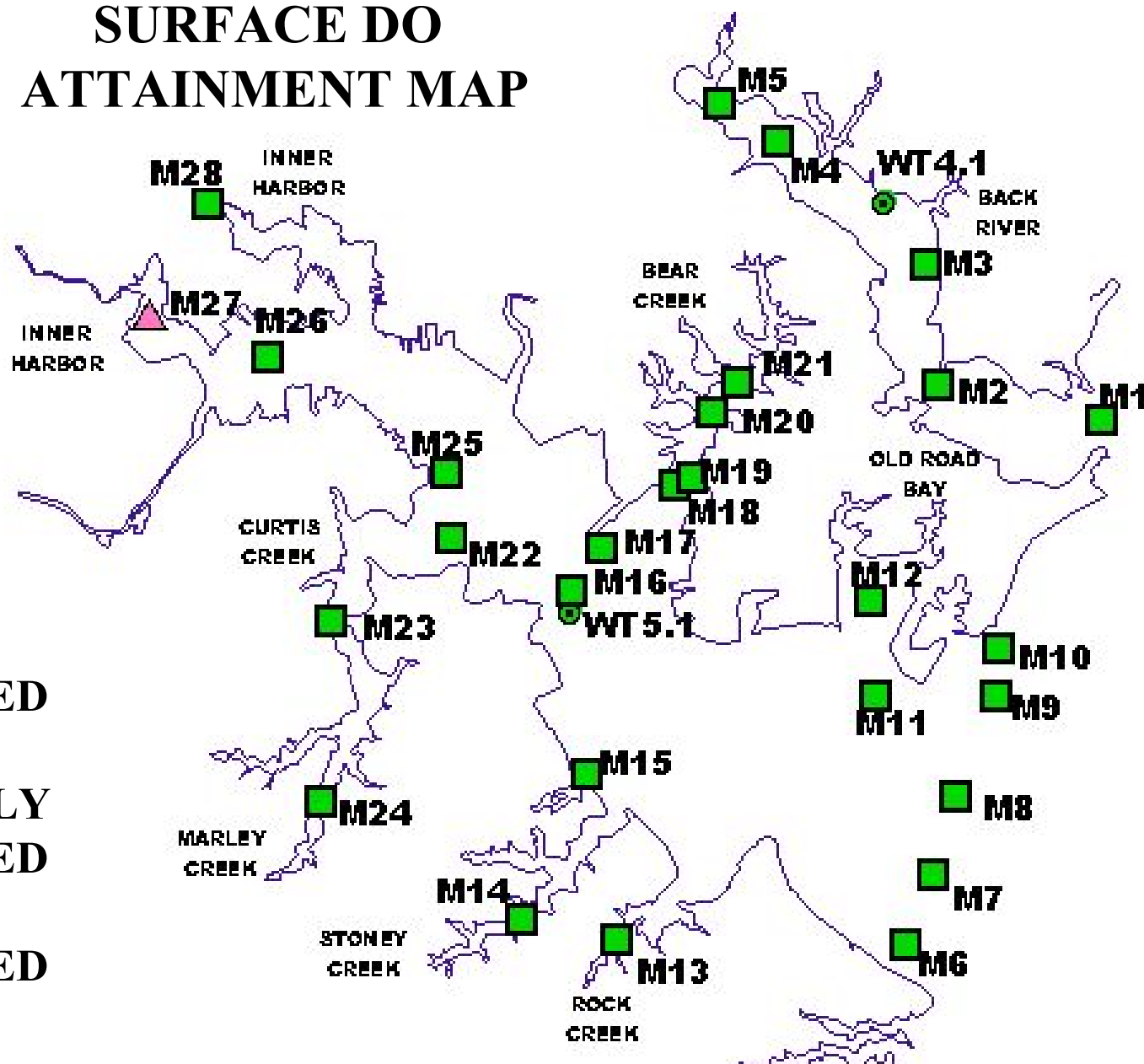
BOTTOM DO ATTAINMENT MAP

INNER HARBOR

M28

M5

M4

WT4.1

BACK RIVER

M27

M26

BEAR CREEK

M3

INNER HARBOR

M21

M20

M2

M1

M25

M19

M18

OLD ROAD BAY

NOT IMPAIRED

CURTIS CREEK

M22

M17

M16

WT 5.1

M12

M23

M10

M11

M9

SLIGHTLY IMPAIRED

M15

M24

M8

MARLEY CREEK

M7

IMPAIRED

M14

STONEY CREEK

M13

M6

ROCK CREEK
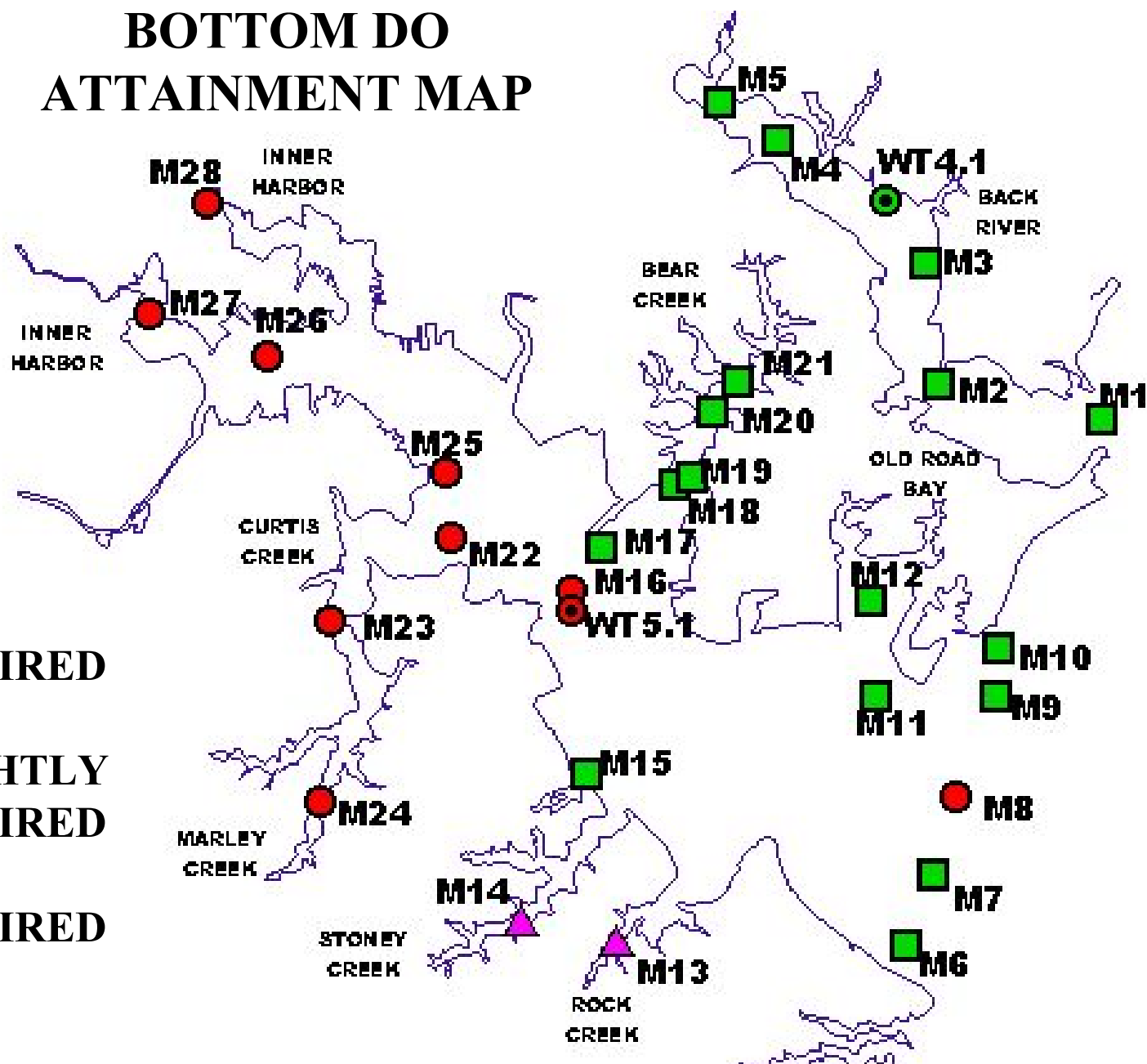
SURFACE AND BOTTOM CHLA ATTAINMENT MAP

Legend:
- NOT IMPAIRED (green square)
- SLIGHTLY IMPAIRED (pink triangle)
- IMPAIRED (red circle)

Station labels: M5, M4, WT4.1, M28, M3, M27, M26, BEAR CREEK, M21, M2, M1, M20, INNER HARBOR, M25, M19, OLD ROAD BAY, M18, CURTIS CREEK, M17, M22, M16, M12, M23, M10, M9, M11, M15, M8, M24, MARLEY CREEK, M7, M14, M6, STONEY CREEK, M13, ROCK CREEK, BACK RIVER
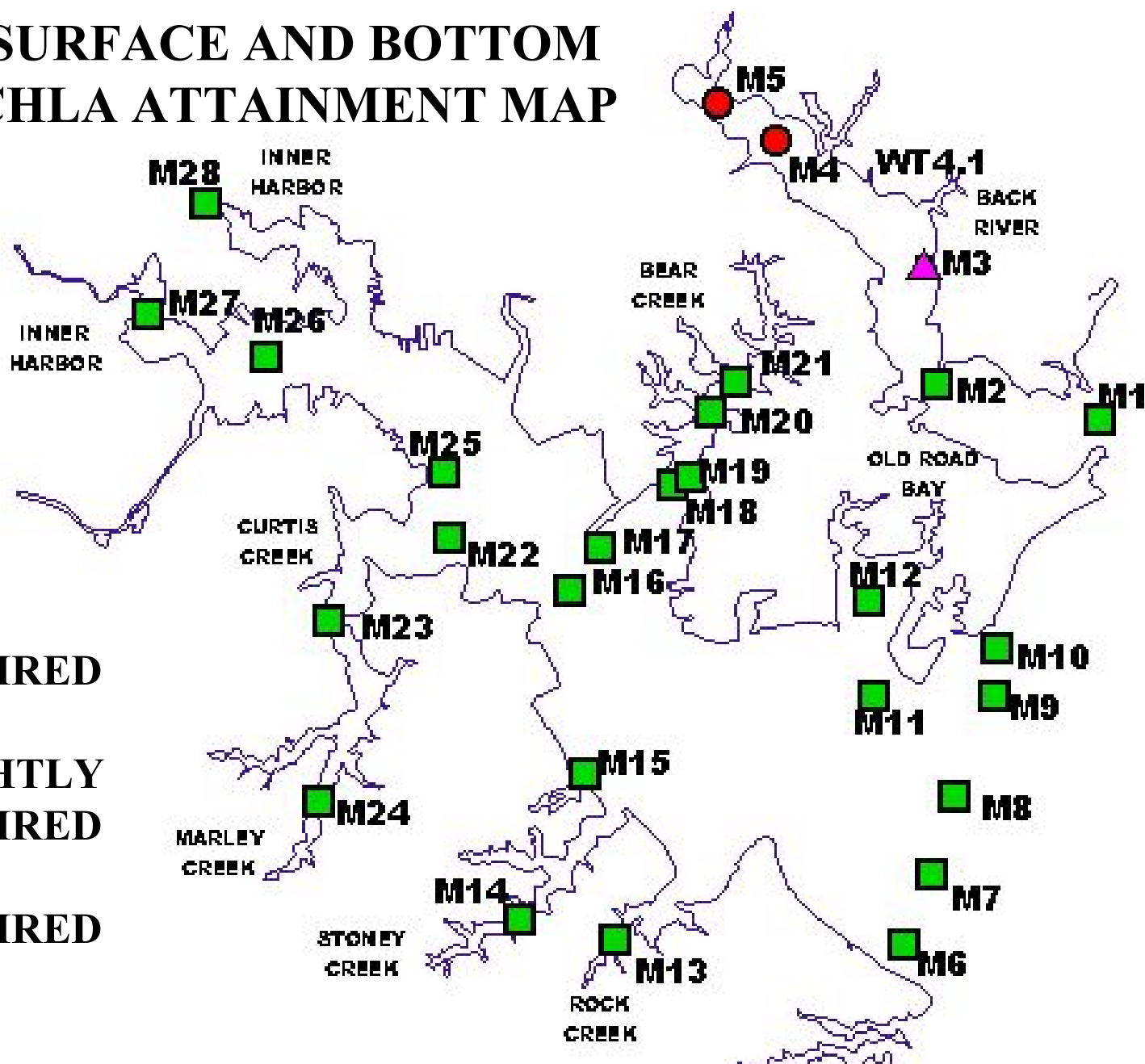
Impairment Summary

The Baltimore Harbor is impaired by
nutrients as shown by **Low DO** level

BALTIMORE HARBOR SENSITIVITY SCENARIOS LOADINGS and DO Attainment Check

SENSITIVITY SCENARIOS					PERCENT NON-ATTAINTMENT				
SCENARIOS	PS TN (lb/day)	PS TP (lb/day)	NPS TN (lb/day)	NPS TP (lb/day)	Deep Water June-Sept (%)	Deep Channel June-Sept (%)	Open Water June-Sept (%)	Migratory Fish Feb-May (%)	Open Water Oct-Jan (%)
CBP ALLOCATION + ZERO PS	0	0	5,260	650	7	76	0	0	0
CBP ALLOCATION + ZERO NPS	9,766	634	0	0	5	75	0	0	0
CBP ALLOCATION + ZERO PS + ZERO NPS	0	0	0	0	3	71	0	0	0
CBP ALLOCATION + ZERO SEDIMENT INITIAL CONDITION	9,766	634	5,260	650	4	63	0	0	0
CBP ALLOCATION + ZERO PS + ZERO NPS + ZERO SEDIMENT INITIAL CONDITION	0	0	0	0	1	49	0	0	0

BALTIMORE HARBOR
OTHER SCENARIOS
LOADINGS and DO Attainment Check

OTHER SCENARIOS					PERCENT NON-ATTAINMENT				
SCENARIOS	PS TN (lb/day)	PS TP (lb/day)	NPS TN (lb/day)	NPS TP (lb/day)	Deep Water June-Sept (%)	Deep Channel June-Sept (%)	Open Water June-Sept (%)	Migratory Fish Feb-May (%)	Open Water Oct-Jan (%)
CBP ALLOCATION +MDE-NPS	9,766	634	6,227	357	8	81	0	0	0
CBP ALLOCATION + MDE-NPS + E3-PS	4,145	140	6,227	357	7	77	0	0	0
CBP ALLOCATION + MDE NPS + CURRENT-PERMITS	20,083	1,437	6,227	357	10	84	0	0	0
CBP ALLOCATION + MDE NPS + EN RPS	6,651	575	6,227	357	8	81	0	0	0

CBP ALLOCATION

DEEP WATER (JUNE—SEPT)

Red = 0.08; Yellow = 0.16; Green = 0.75;
MODEL INST
MODEL DAILY
MODEL MONTHLY
REFERENCE CURVE
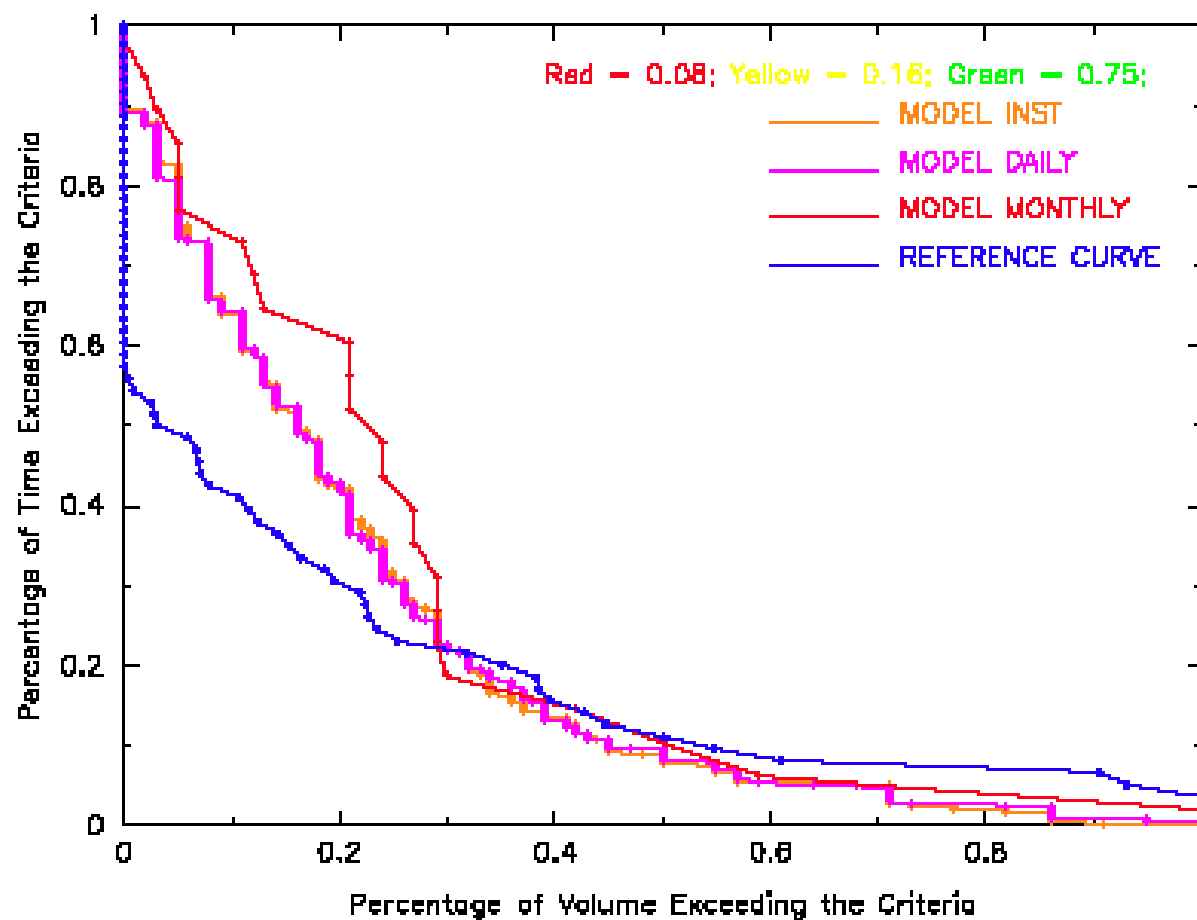
CBP ALLOCATION

MI(FEB-MAY)

CBP ALLOCATION

OPEN WATER (JUNE–SEPT)

Red = 0.00; Yellow = 0.03; Green = 0.97;

- MODEL INST
- MODEL WEEKLY
- MODEL MONTHLY
- REFERENCE CURVE

X-axis: Percentage of Volume Exceeding the Criteria

Y-axis: Percentage of Time Exceeding the Criteria
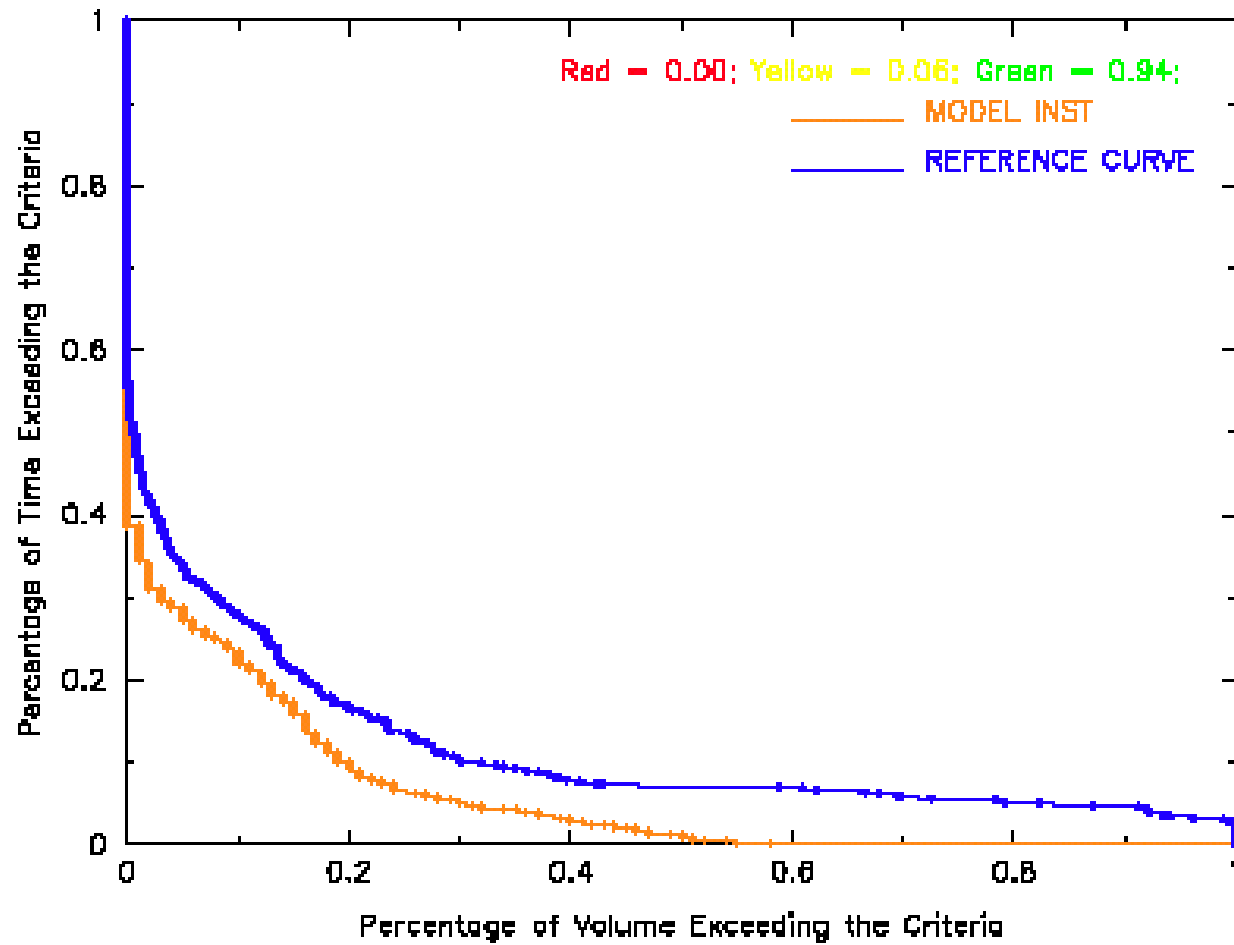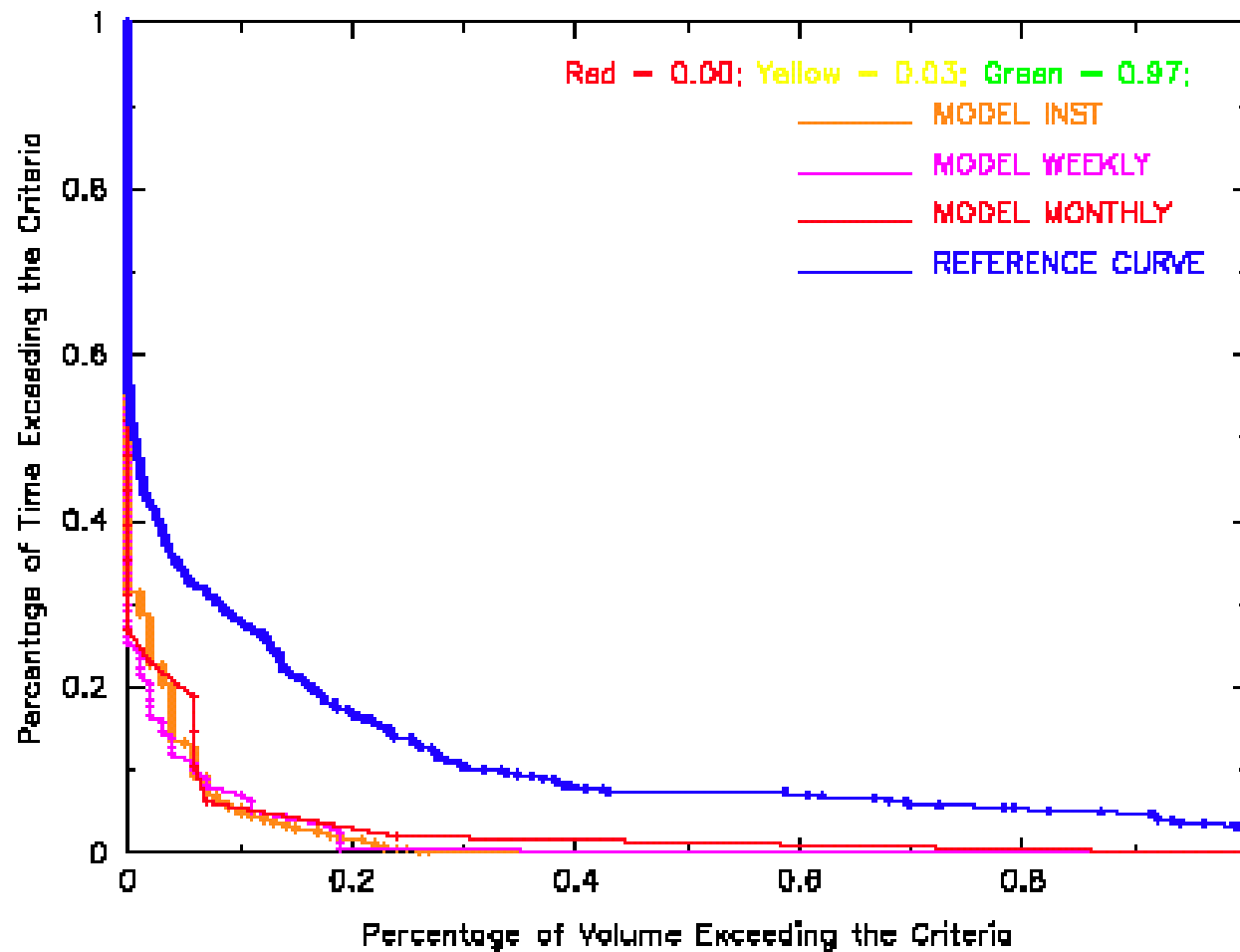
CBP ALLOCATION

OPEN WATER (OCT–JAN)
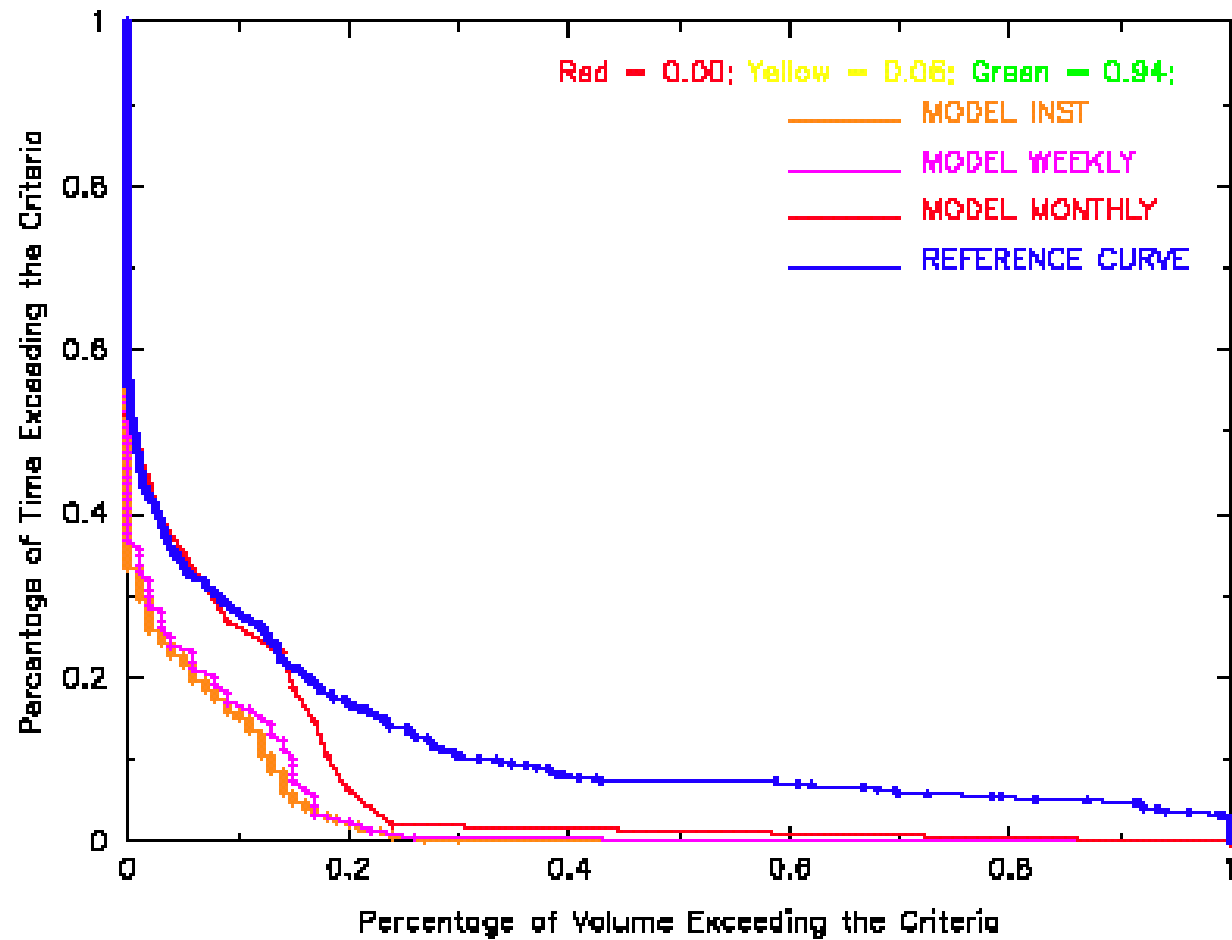
Baltimore Harbor Possible TMDL Scenario Run

- **Load**
  - **Point Source**
    - **Flow: Maximum permit flow**
    - **ENR to Municipal - TN: 4 mg/L annual average (3 mg/L in May - October, 5 mg/L in November - April), TP: 0.3 mg/L**
    - **Industrial PS – CBP Tier III Scenario loads**

  - **Nonpoint Source**
    - **MDE's HSPF model outputs x Pass Through Efficiency**
    - **Pass Through Efficiency = CBP allocation/CBP calibration**
      - **TN=0.33   TP = 0.33**

TMDL Scenario Run

DEEP WATER (JUNE–SEPT)
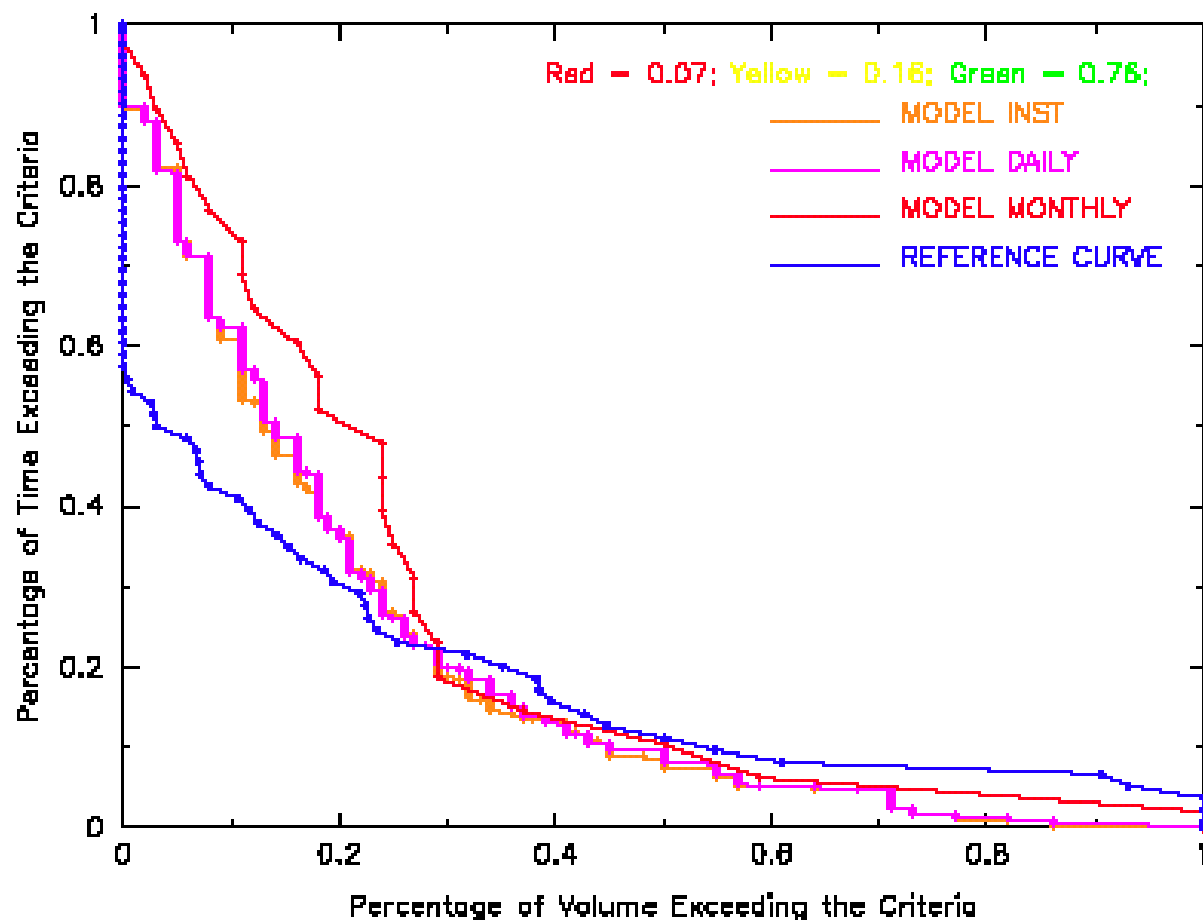
TMDL Scenario Run

MI(FEB—MAY)
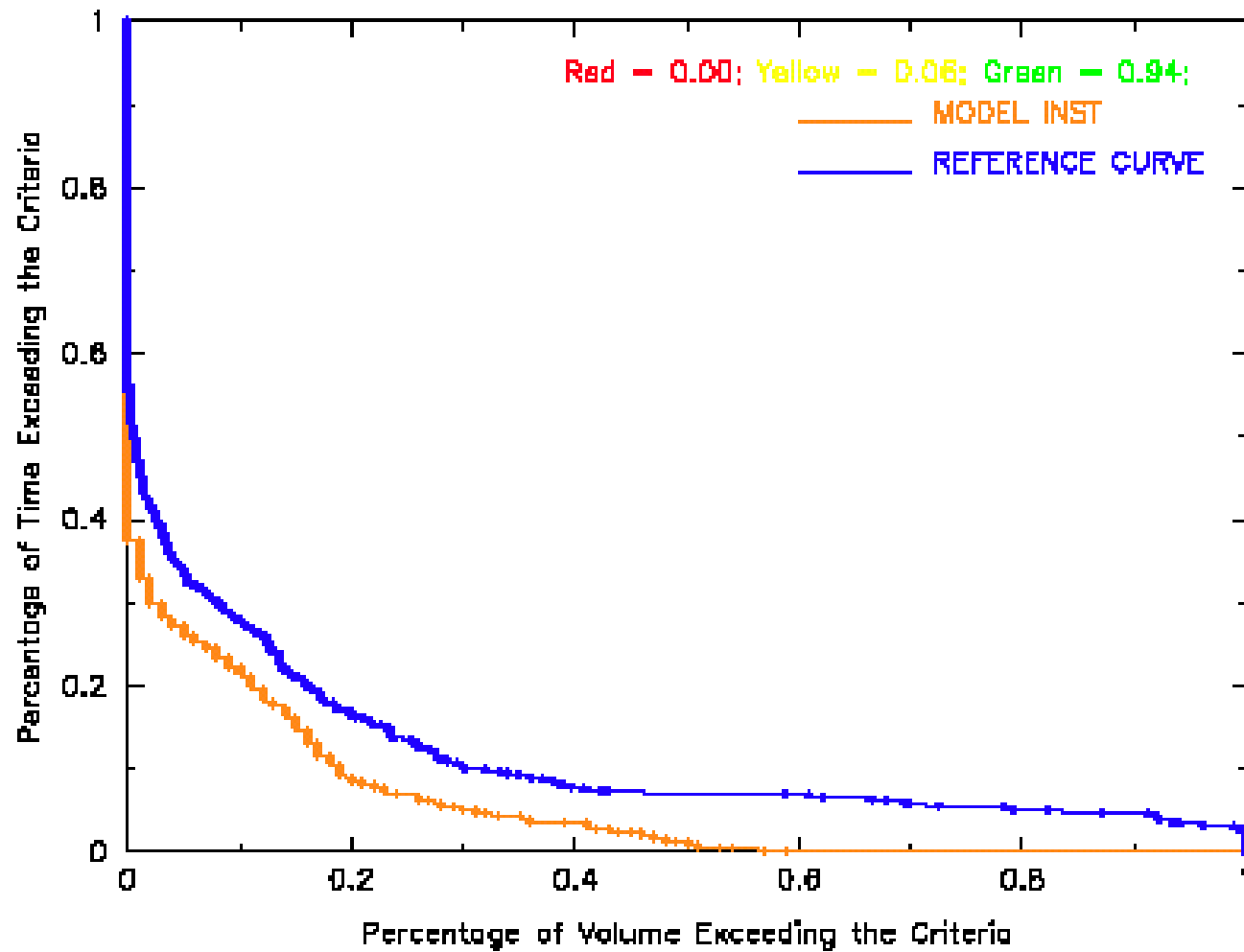
TMDL Scenario Run

OPEN WATER (JUNE-SEPT)
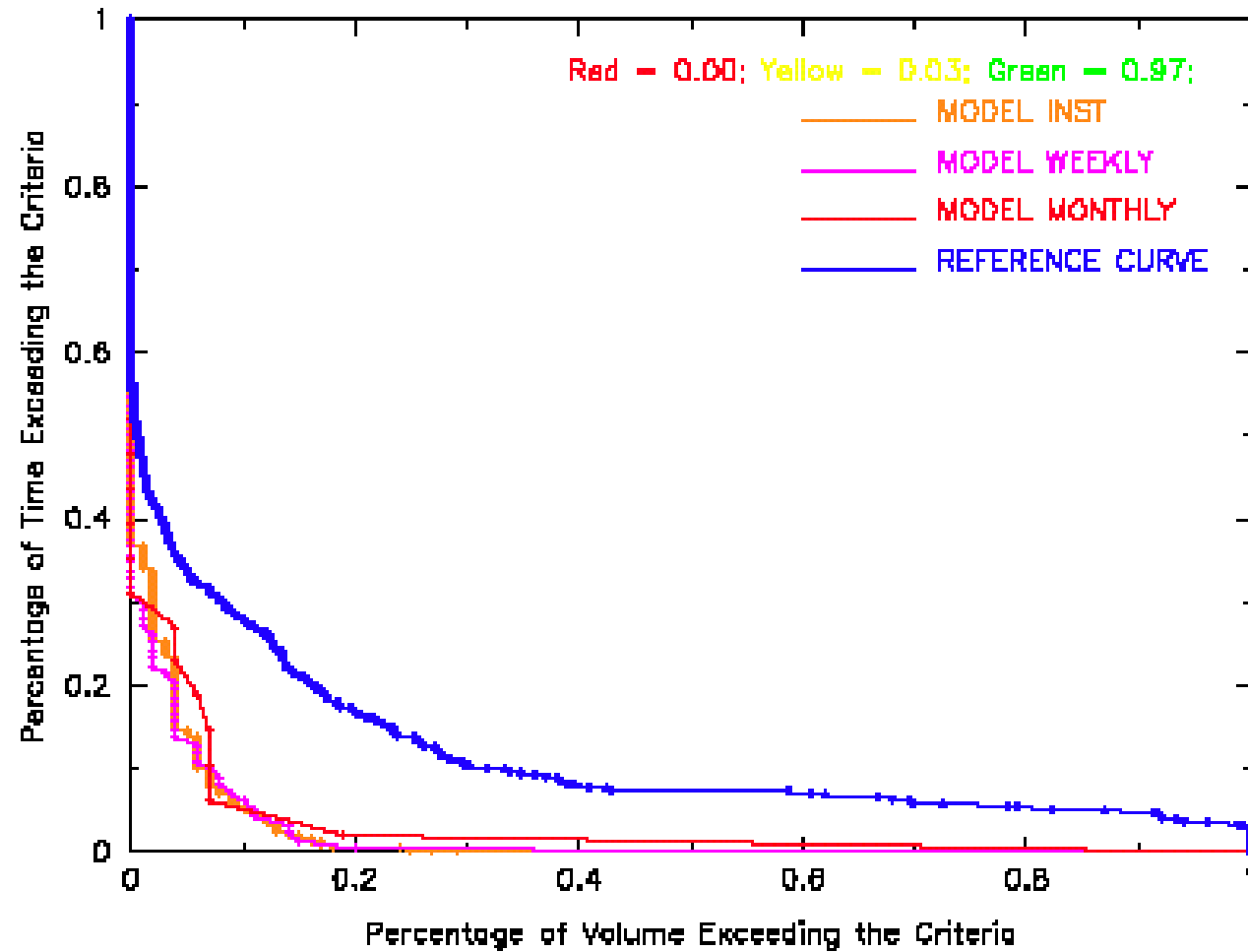
TMDL Scenario Run

OPEN WATER (OCT–JAN)
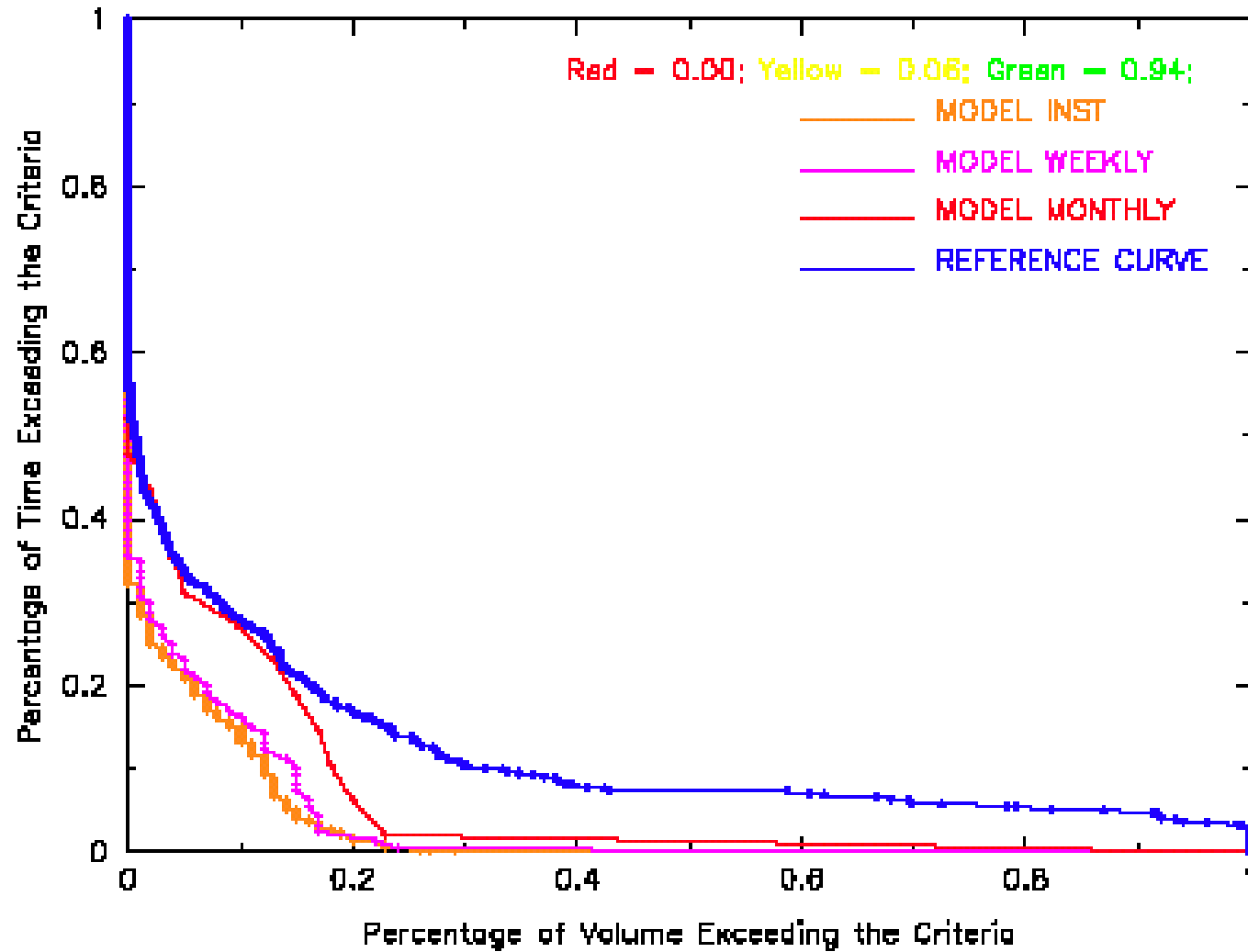
Possible TMDL Scenario Run

DEEP CHANNEL VIOLATION:

- Fort McHenry Channel
- Curtis Bay and Curtis Creek Channel
- Ferry Bar Channel
- Inner Harbor Basin

TMDL Scenario Run

Fort McHenry
Channel
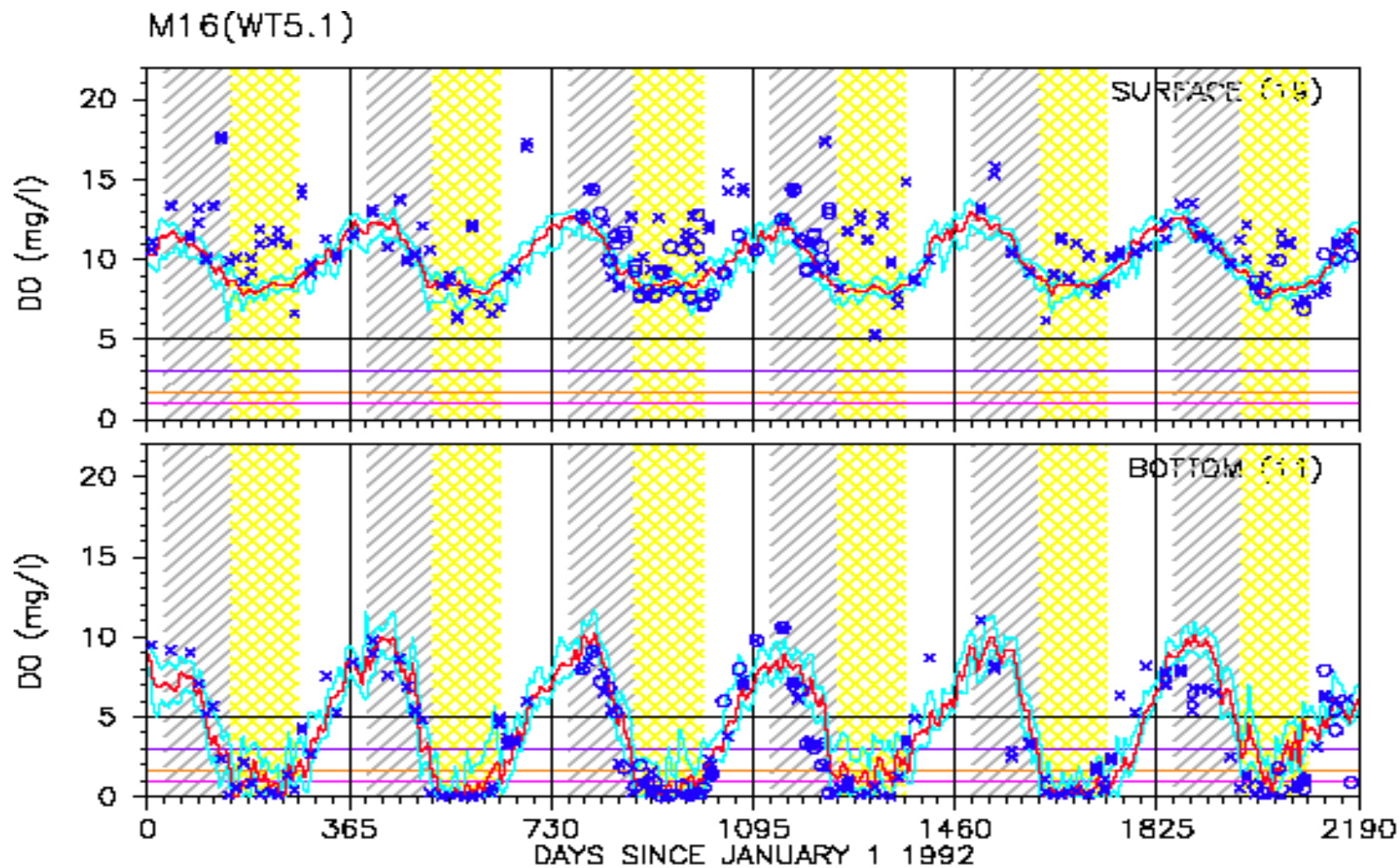
TMDL Scenario Run

Curtis Bay
Channel
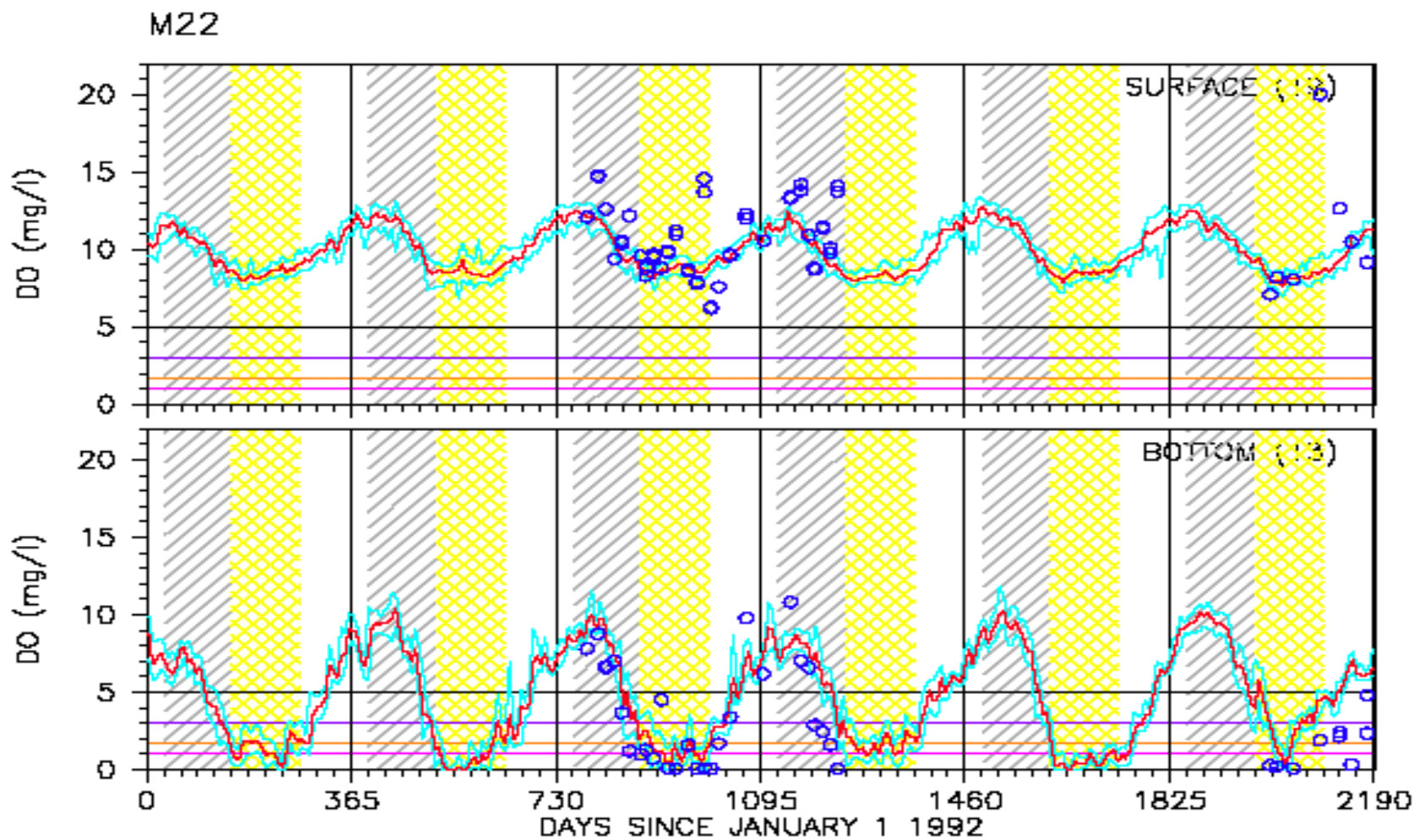
TMDL Scenario Run

Ferry Bar
Channel
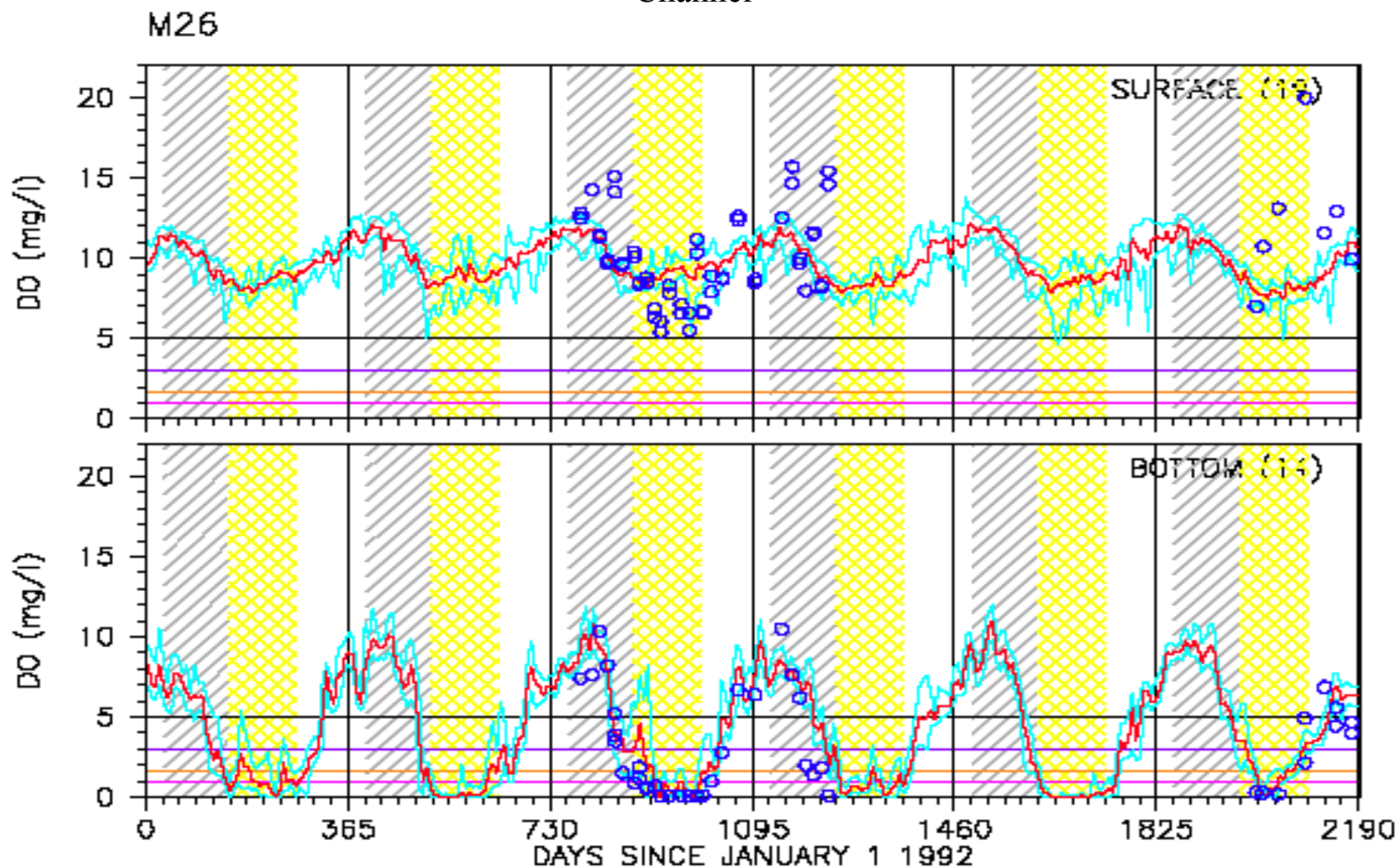
TMDL Scenario Run

Inner Harbor
Basin

M28(INHB)
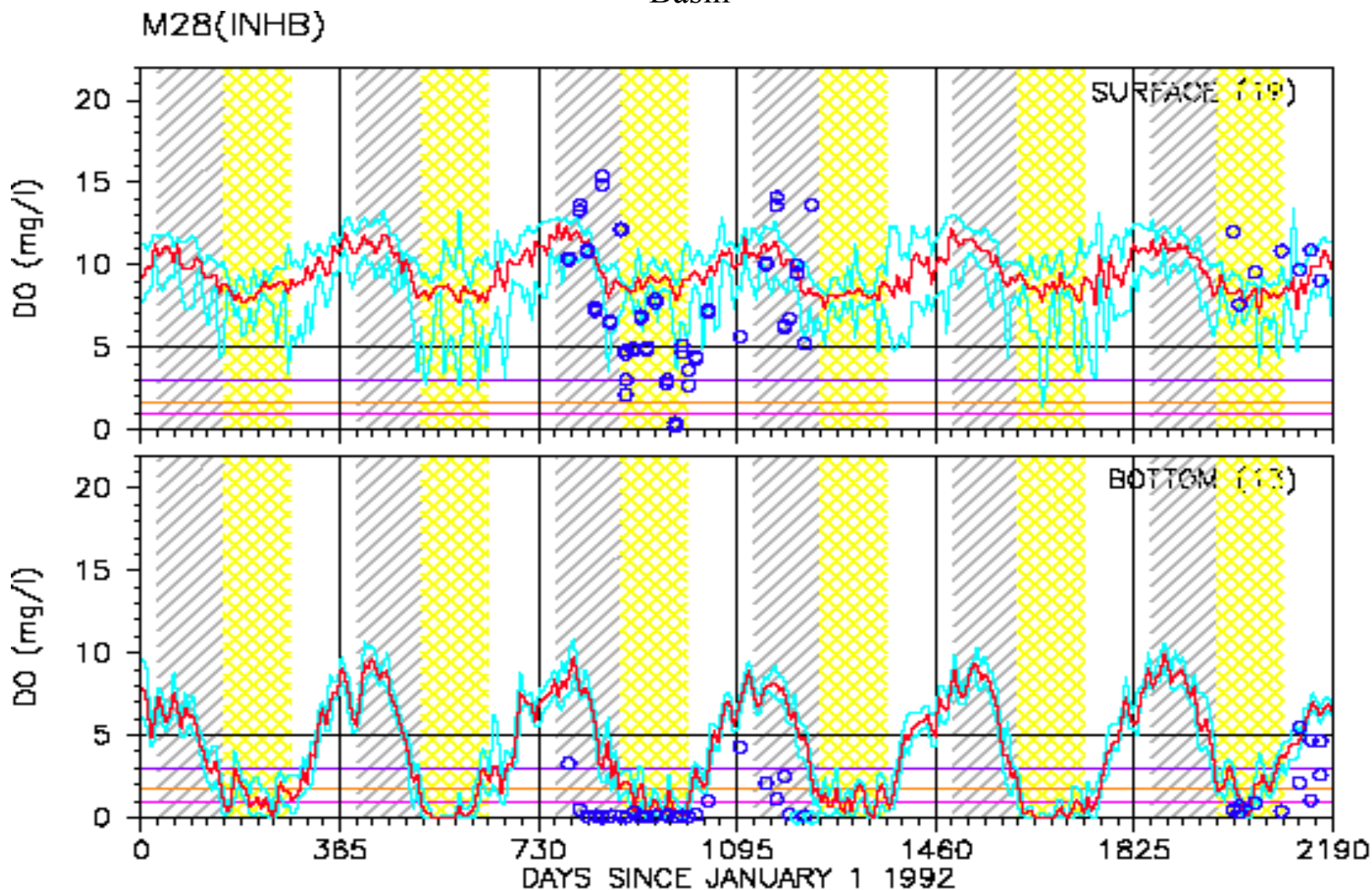
Summary
Baltimore Harbor Possible TMDL Scenario Run

LOADINGS				
	PS TN	PS TP	NPS TN	NPS TP
SCENARIO	(lb/day)	(lb/day)	(lb/day)	(lb/day)
TMDL	6,651	575	4,172	232

- **Water Quality**

  – **Chlorophyll *a*:**

    - below the goal of 50 ug/l in all stations

  – **DO**

    - **Migratory Fish (February - May): DO above 5 mg/L**
    - **Open Water (October - January): DO above 3 mg/L**
    - **Deep Water (June - September)**
      – **7 % above Biological Reference Curve (3 mg/L)**
      – **2 % above Biological Reference Curve (2 mg/L)**
      – **1 % above Biological Reference Curve (1.5 mg/L)**
    - **Deep Channel (June - September): DO < 1 mg/L, 79% of time.**

BALTIMORE HARBOR SCENARIO RESULTS
DO ATTAINMENT CHECK

SCENARIO	PERCENTAGE NONATTAINMENT				
	DEEP WATER (JUNE - SEPT.)	DEEP CHANNEL (JUNE - SEPT.)	OPEN WATER (JUNE - SEPT.)	MIGRATORY FISH (FEB. - MAY)	OPEN WATER (OCT. - JAN.)
MDE CALIBRATION	22	97	1	4	1
CBP ALLOCATION	8	80	0	0	0
MDE POSSIBLE TMDL	7 (3mg/L) 4 (2.5mg/L) 2 (2mg/L) 1 (1.5mg/L) 0 (1mg/L)	79	0	0	0

Proposed DO endpoints for Baltimore Harbor Nutrient TMDLs

- **Deep Water**: Conduct Use Attainability Analysis to determine the appropriate use

- **Deep Channel**: Department pursuing the Modification of Designated Use

  - Propose changing Deep Channel to Navigation Channel

  - Rationale – Harbor channel constantly changing due to dredging and infilling – no stable long-term benthic habitat

  - EPA CBP and MDE currently working on language

Deep Water Cont'd

- Important Thresholds

- The Virginian Province document recommends **2.3 mg/l** as the threshold above which long-term, continuous exposures should not cause lethal conditions for juvenile and adult fish and shellfish (U.S. EPA 2000).

- Bay anchovy larvae are found throughout the water column when bottom oxygen concentrations are above **2 mg/l** (Keister et al. 2000).

- MacGregor and Houde (1996) found that most bay anchovy eggs were distributed in water above thepycnocline when below pycnocline waters had dissolved oxygen concentrations of **< 2 mg/l**

Deep Channel Cont'd

- Rationale – Harbor channel constantly changing due to dredging and infilling – no stable long-term benthic habitat

    - dredging may initially result in the complete removal of animals from the excavation site

    - where the channel or berth has been subjected to continual maintenance dredging over many years, it is unlikely that well-developed benthic communities will occur in or around the area.

    - it is therefore unlikely that their loss as a result of regular maintenance dredging will significantly effect the ecology of the Area of Concern.

    - A review of dredging works in the Chesapeake Bayshowed that rates of recovery of benthic communities following dredging in mud and sand habitat averaged 18 months (Nedwell & Elliot 1998; Newell, Seiderer & Hitchcock 1998),

Load Comparison

- CBP Alloaction
- Draft Tributary Strategy
- Possible MDE TMDL

NON POINT SOURCES
BASELINE AND REDUCED LOADS COMPARISON

CBP Calibration		≠	MDE Calibration	
NPS TN 3.50	NPS TP 0.45		NPS TN 2.50	NPS TP 0.15
33% reduction	33% reduction		33% reduction	33% reduction
CBP Allocation			**Possible MDE TMDL**	
NPS TN 2.34	NPS TP 0.30		NPS TN 1.68	NPS TP 0.10

Why the baseline NPS loads are different?

CBP SEGMENTS
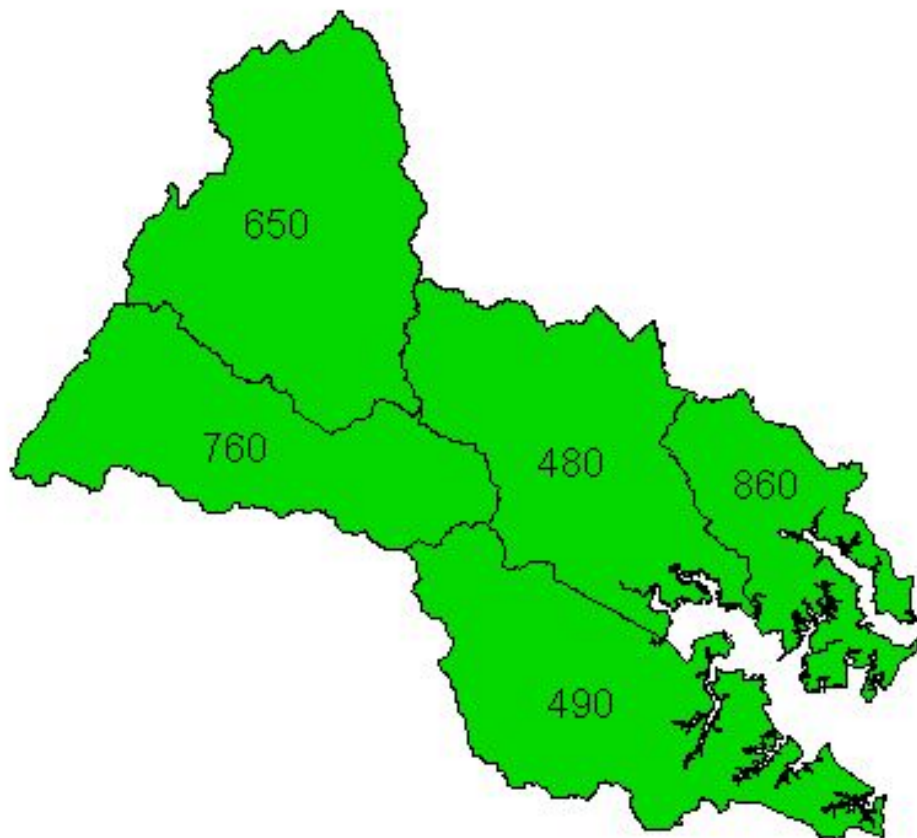
MDE SEGMENTS
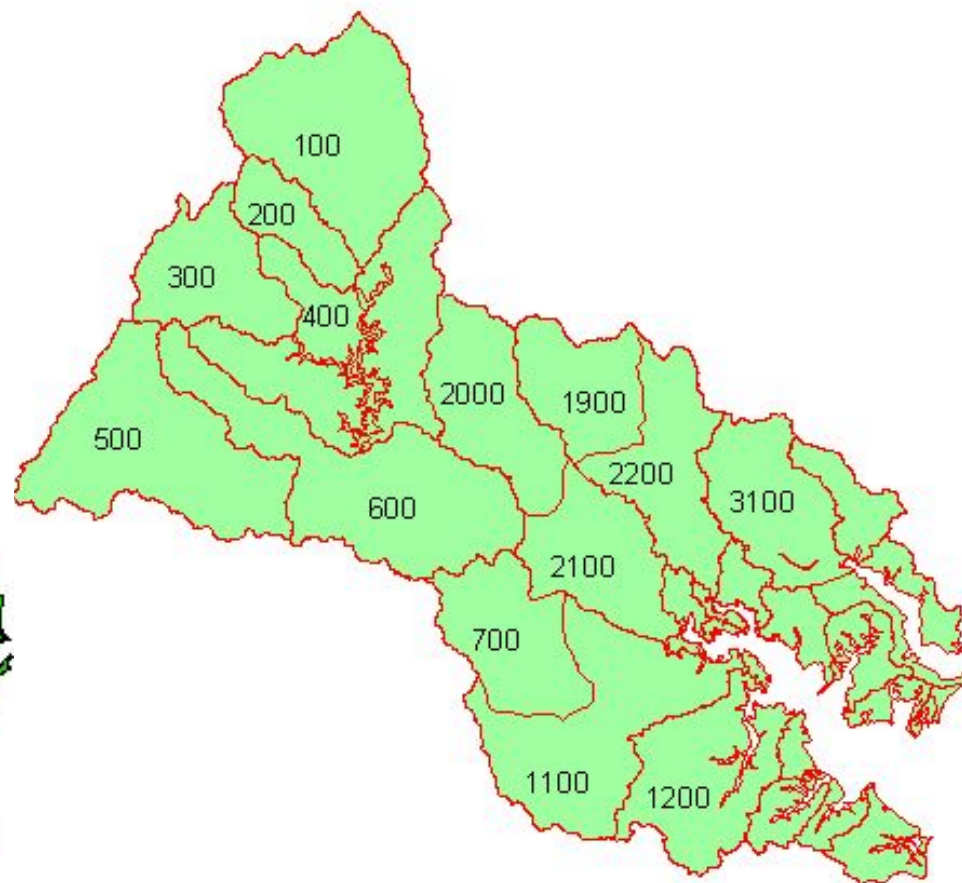
Why the baseline NPS loads are different?

MDE Segments Overlapping
CBP Segments

——— CBP Segments
——— MDE Segments
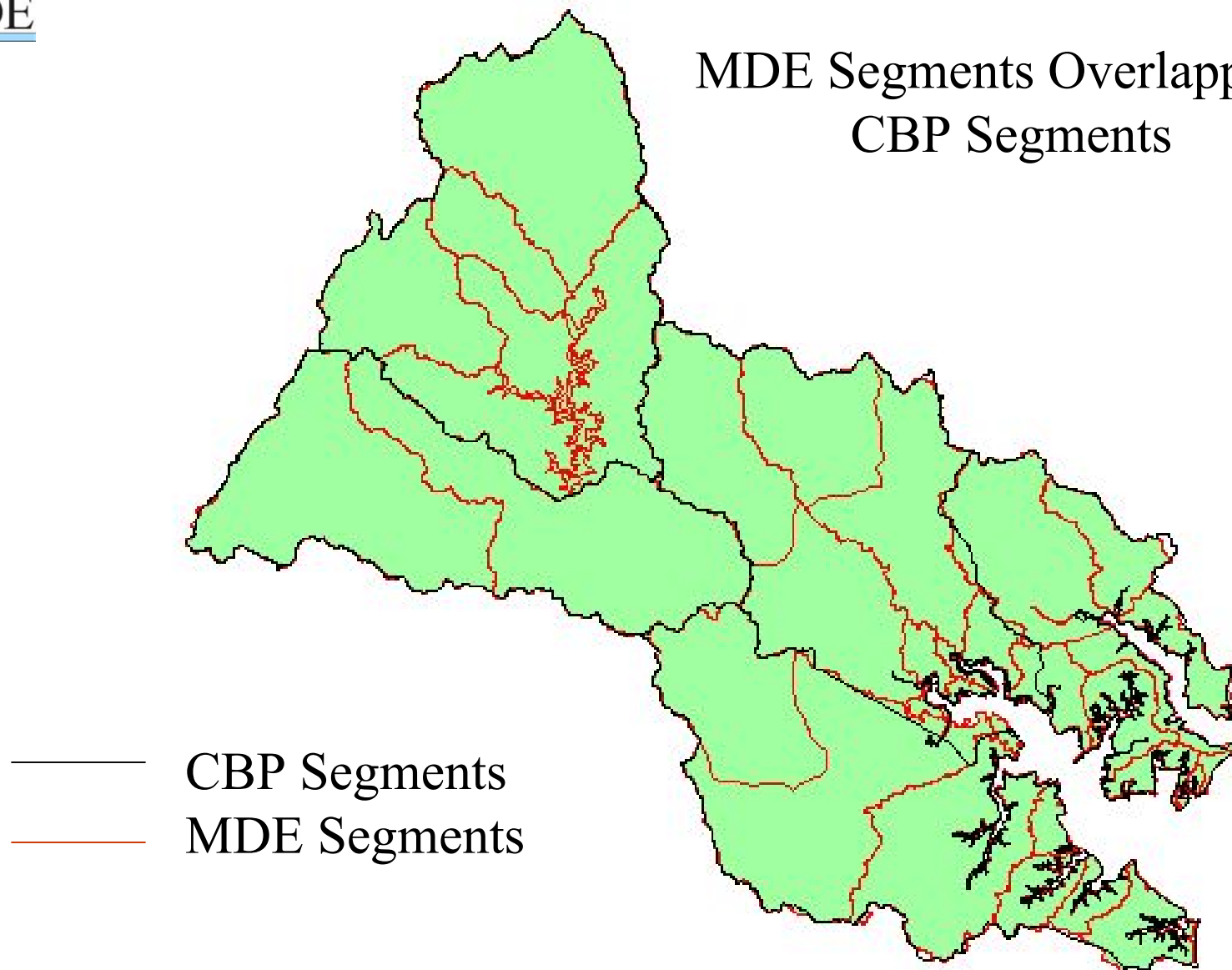
Why the baseline NPS loads are different?

BACK RIVER
MDE Segments
Overlapping CBP Segments
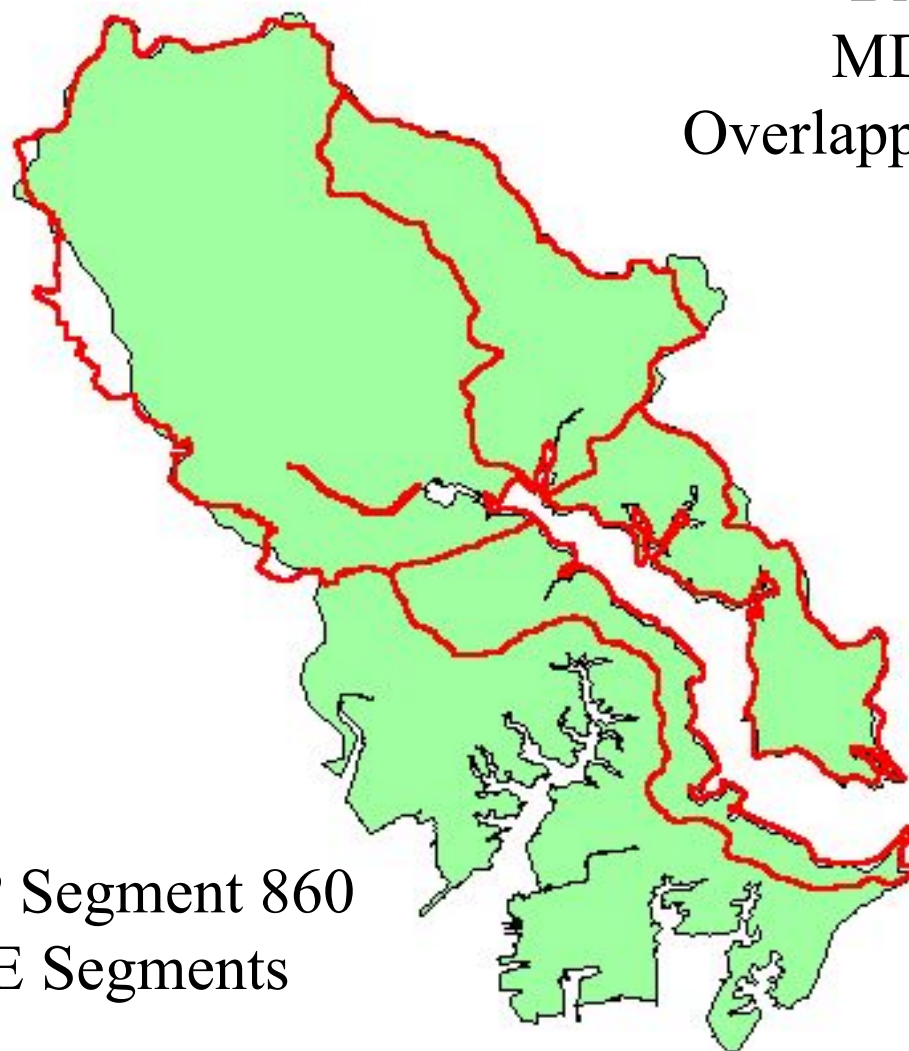
——— CBP Segment 860
——— MDE Segments

Back River Non-point Source Comparison
TN
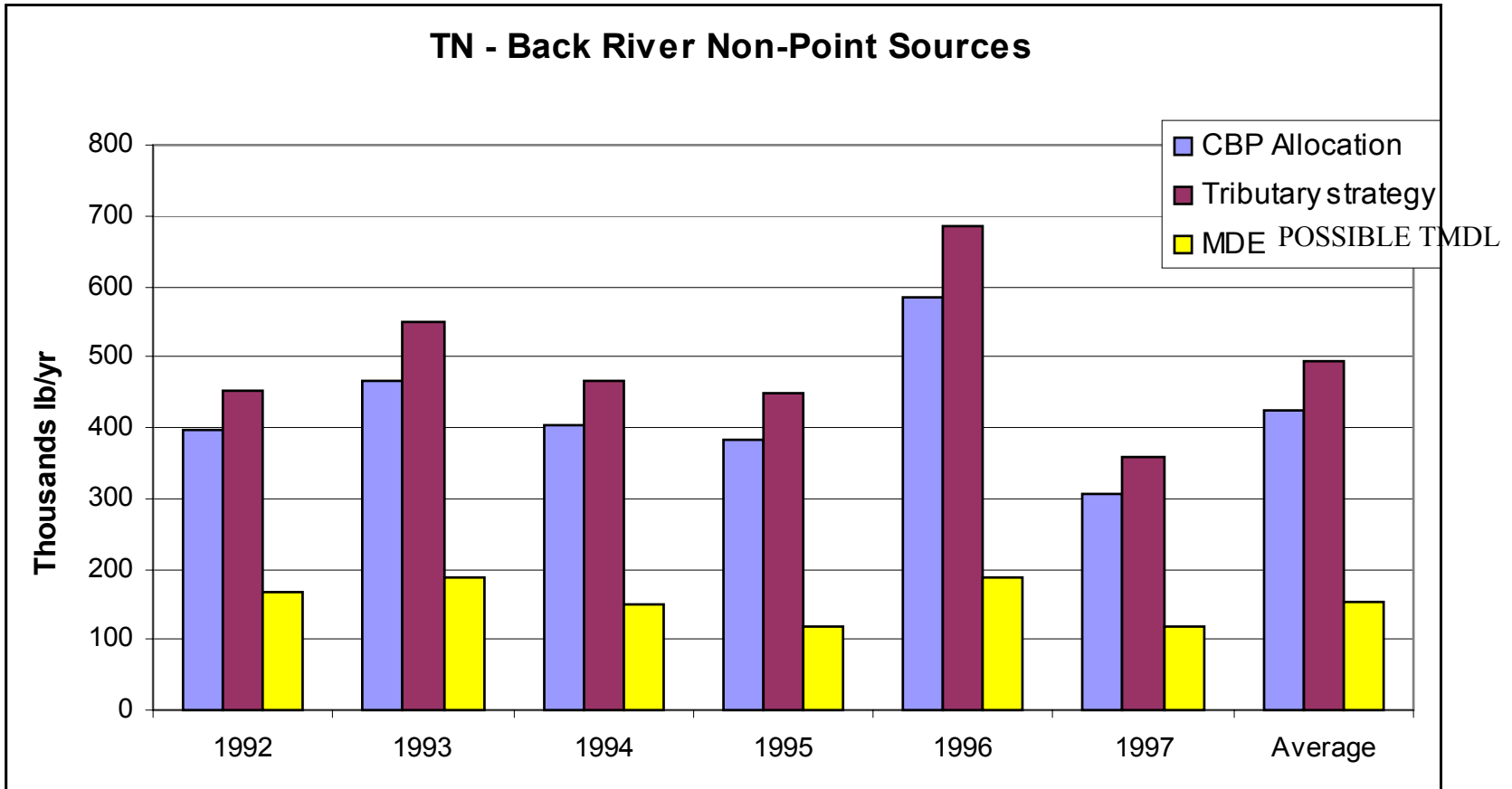
P.S.
NPS baseline loads are different for MDE's possible TMDL and CBP allocation
or Tributary Strategy model runs

Back River Non-point Source Comparison
TP

P.S.
NPS baseline loads are different for MDE's possible TMDL and CBP allocation or Tributary Strategy model runs

Back River Point Source Comparison

Point Source TN to Back River

- CBP Allocation
- Tributary Strategy
- MDE TMDL

Total Nitrogen (l)

- 2,192,803
- 1,409,073
- 1,583,957

BACK RIVER WWTP FLOW
MDE POSSIBLE TMDL RUN - 130 MGD
CBP ALLOCATION &
TRIB STRATEGY - 180 MGD

Point Source TP to Back River

- CBP Allocation
- Tributary Strategy
- MDE TMDL

Total Phosphorus (l)

- 109,640
- 58,025
- 79,198

Baltimore Harbor Non-point Source Comparison TN

TN - Baltimore Harbor Non-Point Sources

Legend:
- CBP Allocation
- Tributary strategy
- MDE

Y-axis: Thousands lb)

X-axis categories: 1992, 1993, 1994, 1995, 1996, 1997, Average

P.S.
NPS baseline loads are different for MDE's possible TMDL and CBP allocation or Tributary Strategy model runs

Baltimore Harbor Non-point Source Comparison TP

P.S.
NPS baseline loads are different for MDE's possible TMDL and CBP allocation or Tributary Strategy model runs

Baltimore Harbor Point Source Comparison

Point Source TN to Baltimore Harbor

Legend:
- CBP Allocation
- Tributary Strategy
- MDE TMDL

Total Nitrogen (lbs/yr)

- CBP Allocation: 3,562,720
- Tributary Strategy: 1,525,347
- MDE TMDL: 2,144,257

Point Source TP to Baltimore Harbor

Legend:
- CBP Allocation
- Tributary Strategy
- MDE TMDL

Total Phosphorus (lbs/yr)

- CBP Allocation: 230,974
- Tributary Strategy: 88,042
- MDE TMDL: 112,834
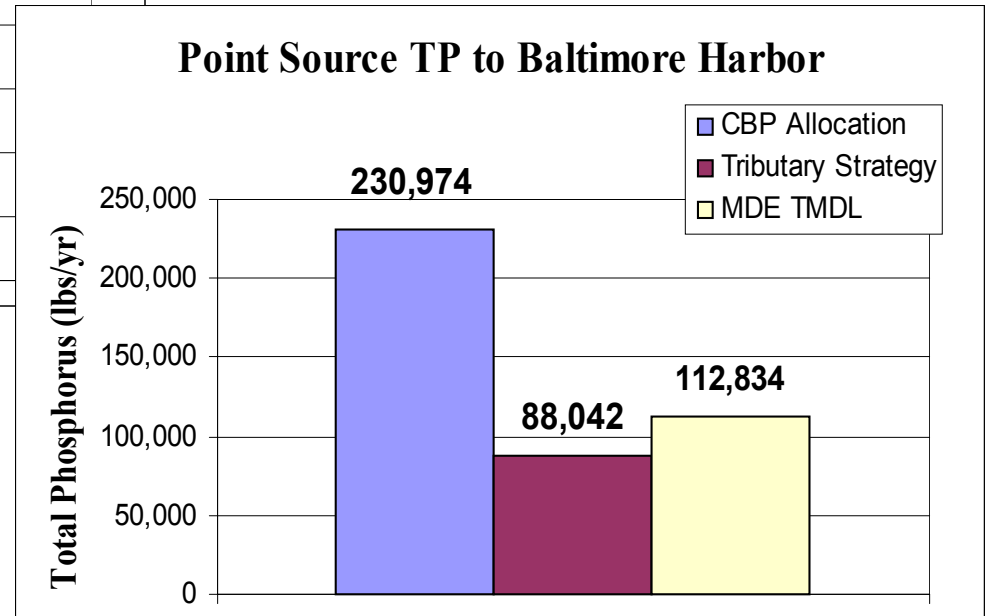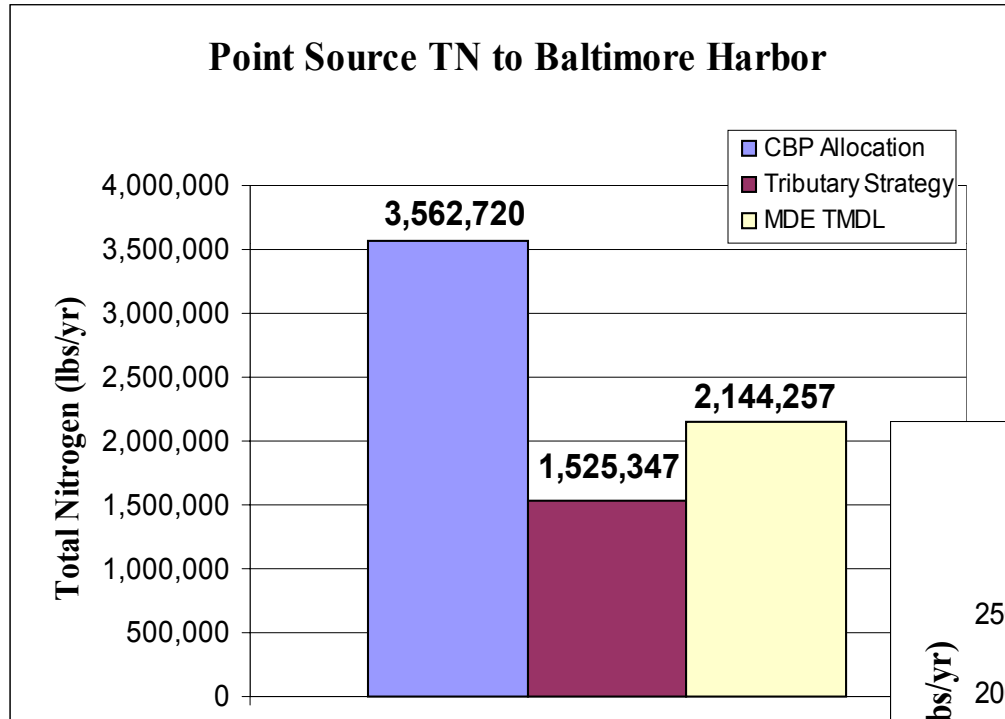
BETH STEEL OUTFALL FLOW
MDE POSSIBLE TMDL RUN - 50 MGD
CBP ALLOCATION &
TRIB STRATEGY - 0 MGD

OVERALL LOADING COMPARISON
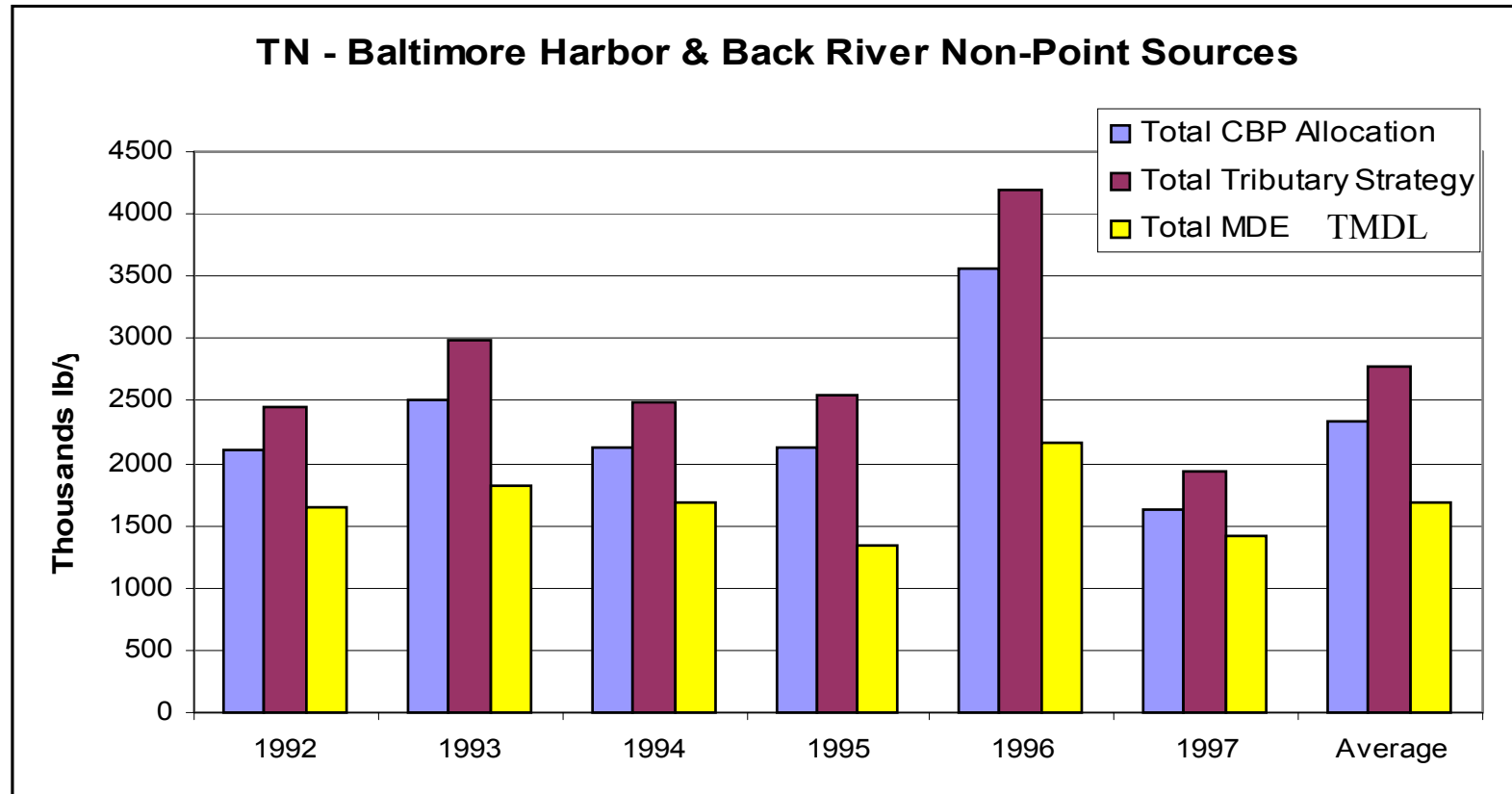
Patapsco and Back River
Non-point source comparison

P.S.
NPS baseline loads are different for MDE's possible TMDL and CBP allocation or Tributary Strategy model runs

Patapsco and Back River
Non-point source comparison

TP - Baltimore Harbor & Back River Non-Point Sources

Legend:
- Total CBP Allocation
- Total Tributary Strategy
- Total MDE

TMDL

Y-axis: Thousands ll (0, 100, 200, 300, 400, 500, 600)

X-axis categories: 1992, 1993, 1994, 1995, 1996, 1997, Average
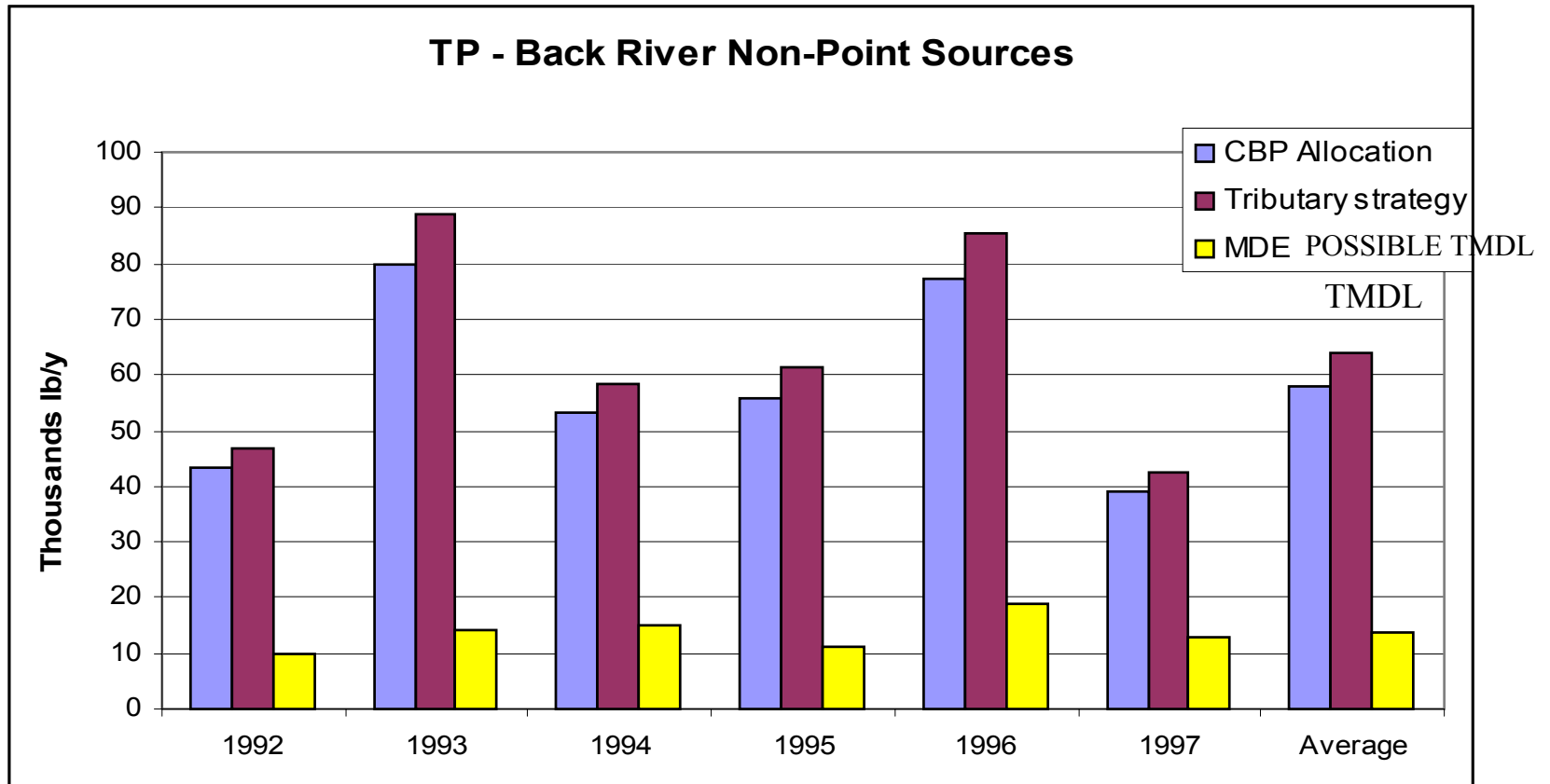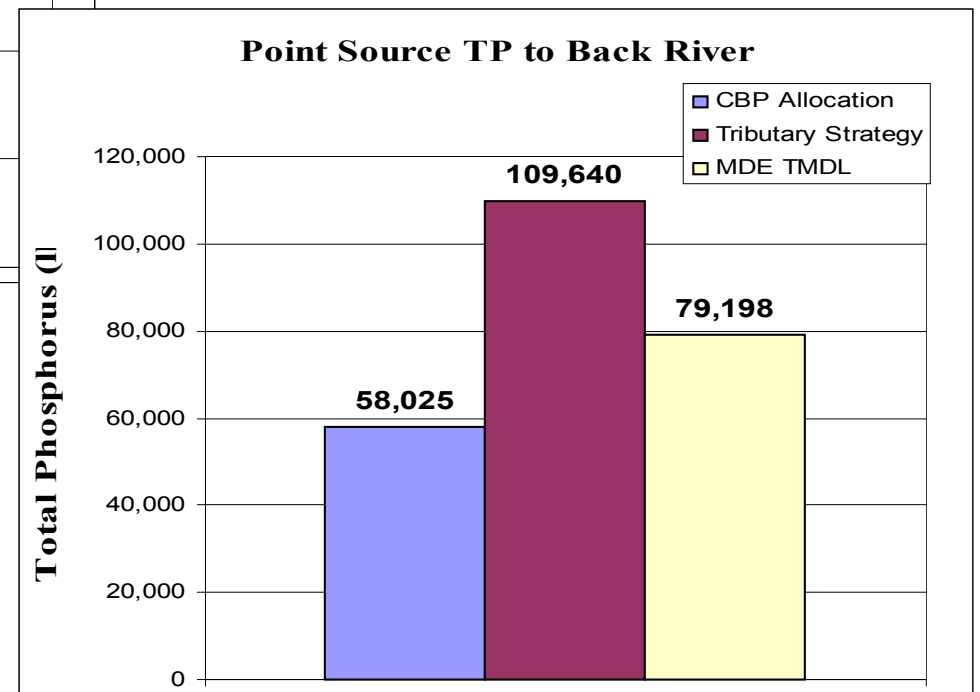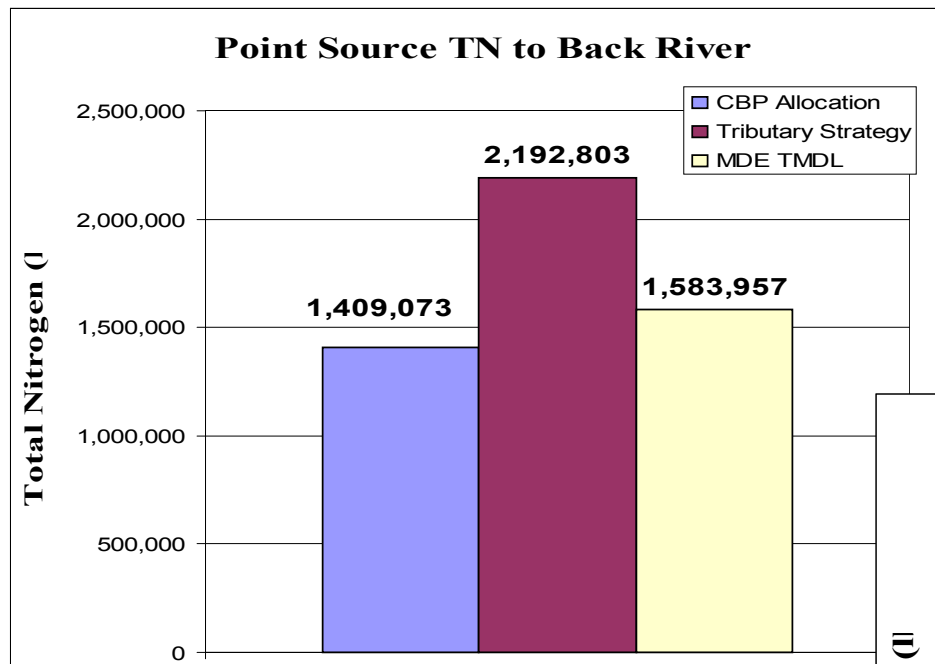
P.S.
NPS baseline loads are different for MDE's possible TMDL and CBP allocation or Tributary Strategy model runs

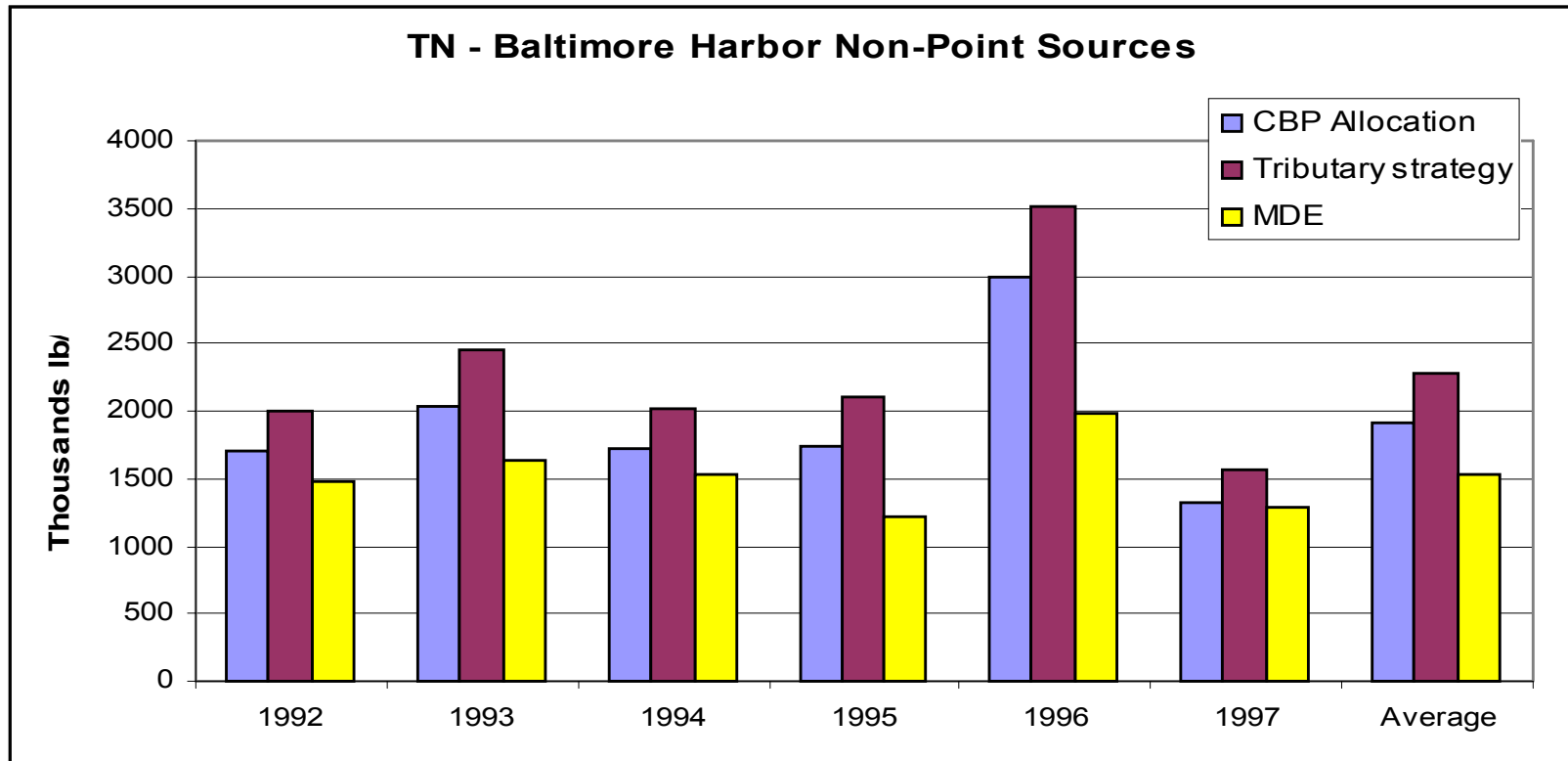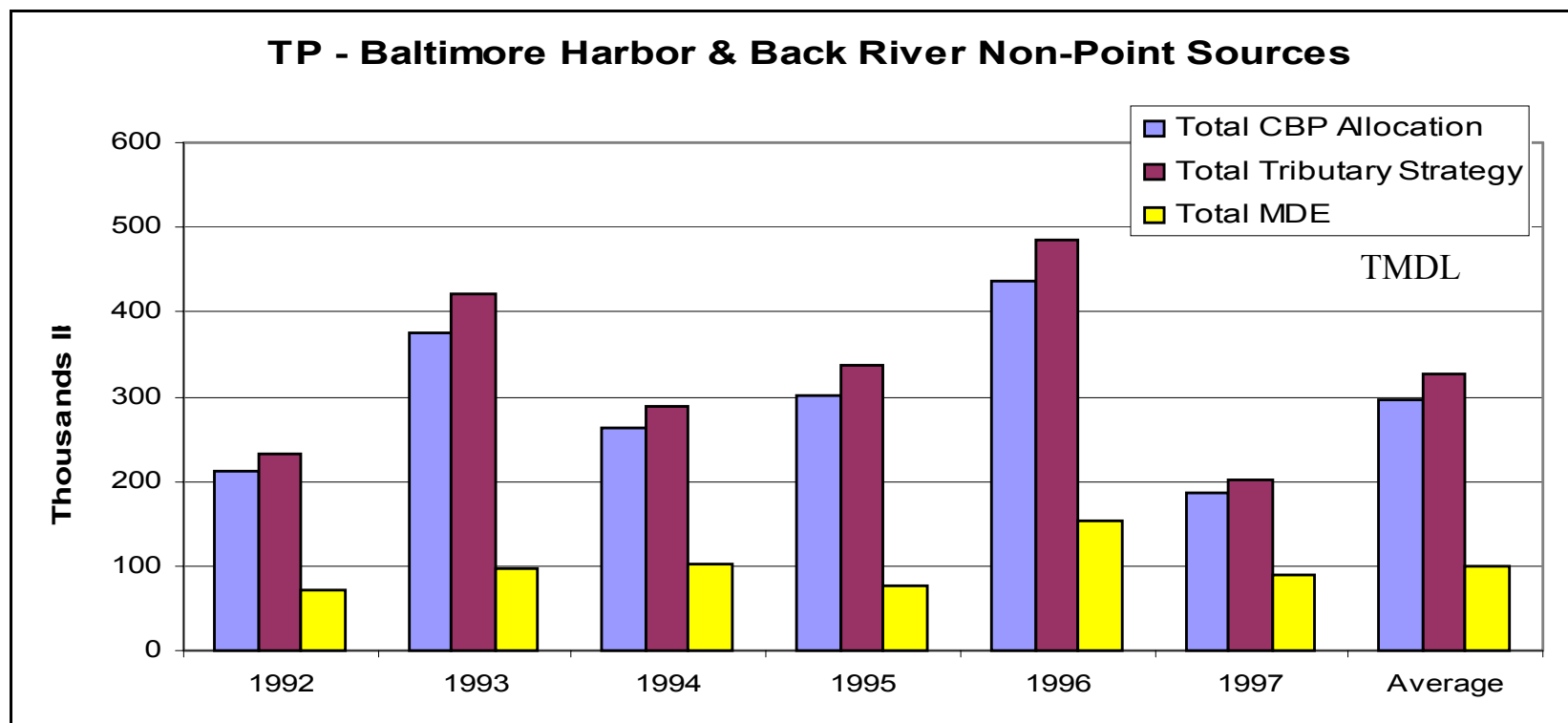# Patapsco and Back River point source comparison

Point Source TN

Total Nitrogen (lbs/yr)

Legend:
- CBP Allocation
- Tributary Strategy
- MDE TMDL

- CBP Allocation: 4,971,793
- Tributary Strategy: 3,718,150
- MDE TMDL: 3,739,943

Point Source TP

Total Phosphorus (lbs/yr)

Legend:
- CBP Allocation
- Tributary Strategy
- MDE TMDL

- CBP Allocation: 288,999
- Tributary Strategy: 197,682
- MDE TMDL: 191,96
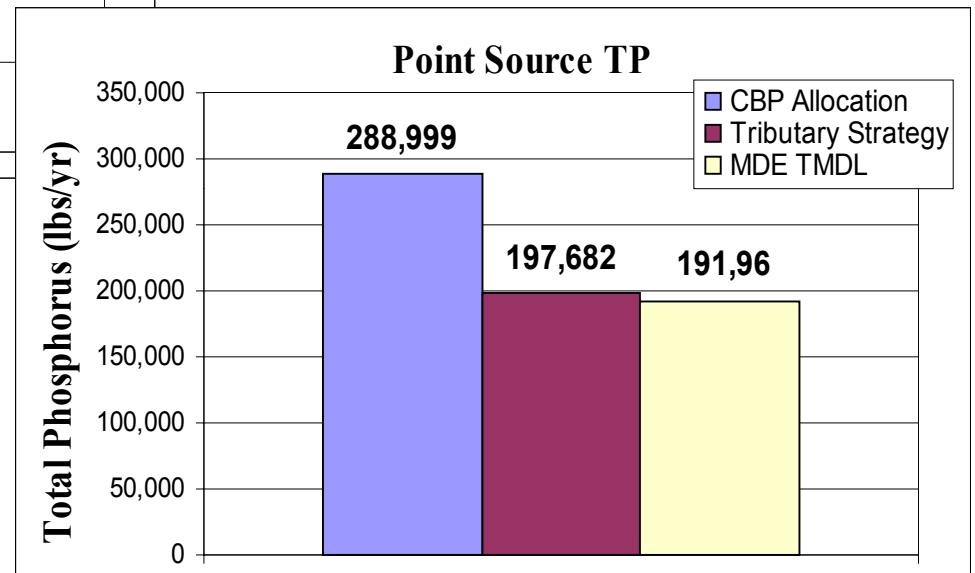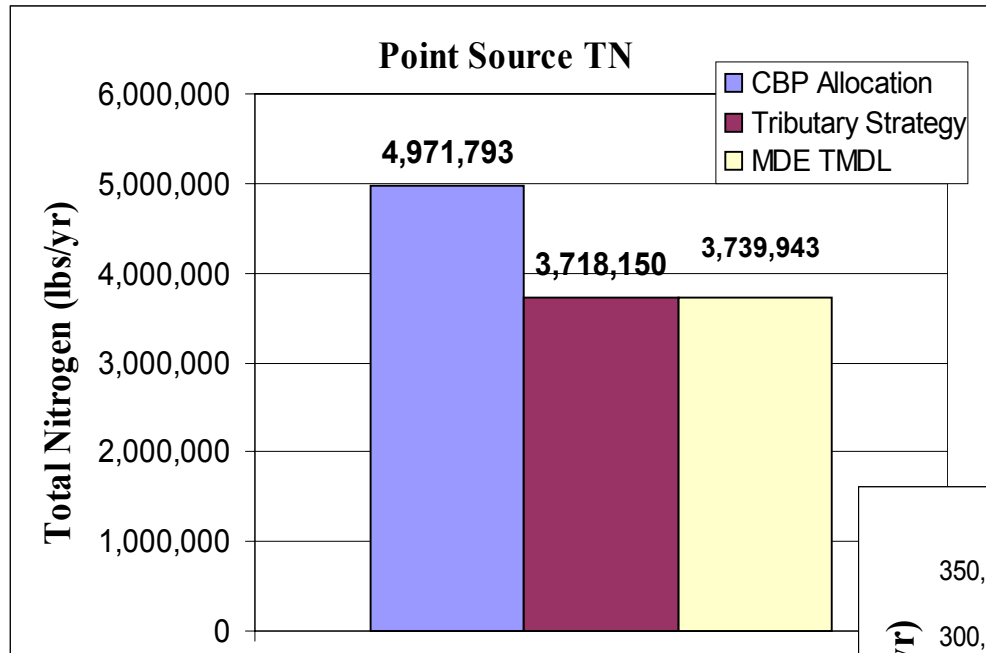
POINT SOURCES COMPARISON

FACILITY	NPDES	TRIBUTARY STRATEGY (from CBP)					CBP ALLOCATION				
		FLOW (MGD)	TN (mg/l)	TP (mg/l)	TN Delivered Load (lbs/yr)	TP Delivered Load (lbs/yr)	FLOW (MGD)	TN (mg/l)	TP (mg/l)	TN Delivered Load (lbs/yr)	TP Delivered Load (lbs/yr)
BACK RIVER	MD0021555	**180.000**	**4**	**0.2**	**2,192,803**	**109,640**	**88.0**	**5**	**0.2**	**1,409,073**	**58,025**
BETHLEHEM STEEL CORPOR	MD0001201	0.000	4	0.3	0	0	-110.0	-5	-0.25	1,772,784	87,894
PATAPSCO	MD0021601	73.000	4	0.3	889,304	66,698	73.0	5	0.5	1,172,523	120,711
COX CREEK	MD0021661	15.000	4	0.3	182,734	13,705	12.3	5	0.5	197,492	20,331
W R GRACE	MD0000311	4.065	25.1	0.146	310,737	1,809				327,744	1,964
ERACHEM COMILOG	MD0001775	0.128	223	0.03	87,006	12				91,768	13
				Sub-Total=>	3,662,583	191,864			Sub-Total=>	4,971,383	288,940
CONGOLEUM	MD0001384	0.263	5	0.2	0	0					
FREEDOM DISTRICT	MD0021512	3.500	4	0.3	35,715	3,169					
GAITHER MANOR	MD0022845	0.025	18	3	1,126	222					
HOLIDAY MOBILE ESTATES	MD0053082	0.114	18	3	6,231	1,039					
MOUNT AIRY	MD0022527	0.950	4	0.3	9,694	860					
PHEASANT RIDGE	MD0024546	0.027	18	3	1,246	246					
SOUTH CARROLL HIGH SCHOO	MD0024589	0.007	18	3	320	63					
ST TIMOTHY SCHOOL	MD0056103	0.006	18	3	346	58					
VILLA JULIE COLLEGE	MD0066001	0.008	18	3	435	72	0.013	10.18	1.41	410	59
WOODSTOCK TRAINING CENTE	MD0023906	0.010	18	3	454	89					
				Sub-Total =>	*55,567*	*5,819*			*Sub-Total =>*	*410*	*59*
US GYPSUM 002A	MD0001457										
US GYPSUM 002											
MILLENIUM SPECIALTY 0	MD0001279										
MILLENIUM SPECIALTY 002A											
EASTERN STAINLESS	MD0000981										
Baltimore Harbor					1,525,347	88,042				3,562,720	230,974
		Total Tributary Strategy =>			**3,718,150**	**197,682**	**TOTAL CBP=>**			**4,971,793**	**288,999**

POINT SOURCES COMPARISON

FACILITY	NPDES	TRIBUTARY STRATEGY (from CBP)					MDE POSSIBLE TMDL scenario				
		FLOW (MGD)	TN (mg/l)	TP (mg/l)	TN Delivered Load (lbs/yr)	TP Delivered Load (lbs/yr)	FLOW (MGD)	TN (mg/l)	TP (mg/l)	TN Delivered Load (lbs/yr)	TP Delivered Load (lbs/yr)
BACK RIVER	MD0021555	**180.000**	**4**	**0.2**	**2,192,803**	**109,640**	**130**	**4**	**0.2**	**1,583,957**	**79,198**
BETHLEHEM STEEL CORPORATION-SPARROWS POINT	MD0006204	0.000	4	0.3	0	0	50	4	0.2	609,214	30,461
PATAPSCO	MD0021601	73.000	4	0.3	889,304	66,698	73	4	0.3	889,453	66,709
COX CREEK	MD0021661	15.000	4	0.3	182,734	13,705	15	4	0.3	182,764	13,707
W R GRACE	MD0000311	4.065	25.1	0.146	310,737	1,809	4.066	29.4704	0.146	365,000	1,809
ERACHEM COMILOG	MD0001775	0.128	223	0.03	87,006	12	0.128	223	0.03	87,006	12
				Sub-Total=>	3,662,583	191,864			Sub-Total=>	3,717,394	191,896
CONGOLEUM	MD0001384	0.263	5	0.2	0	0					
FREEDOM DISTRICT	MD0021512	3.500	4	0.3	35,715	3,169					
GAITHER MANOR	MD0022845	0.025	18	3	1,126	222					
HOLIDAY MOBILE ESTATES	MD0053082	0.114	18	3	6,231	1,039					
MOUNT AIRY	MD0022527	0.950	4	0.3	9,694	860					
PHEASANT RIDGE	MD0024546	0.027	18	3	1,246	246					
SOUTH CARROLL HIGH SCHOOL	MD0024589	0.007	18	3	320	63					
ST TIMOTHY SCHOOL	MD0056103	0.006	18	3	346	58					
VILLA JULIE COLLEGE	MD0066001	0.008	18	3	435	72					
WOODSTOCK TRAINING CENTER	MD0023906	0.010	18	3	454	89					
				Sub-Total =>	*55,567*	*5,819*					
US GYPSUM 002A	MD0001457						0.007	18	3	384	64
US GYPSUM 002							0.016	0	0	0	0
MILLENIUM SPECIALTY 001	MD0001279						0.080	35.58	0	8,670	0
MILLENIUM SPECIALTY 002A							0.545	8.126	0	13,495	0
EASTERN STAINLESS	MD0000981						0.237	0	0	0	0
									Sub-total =>	22,549	64
Baltimore Harbor					1,525,347	88,042				2,155,986	112,762
				Total Tributary Strategy =>	**3,718,150**	**197,682**			**Total Possible TMDL =>**	**3,739,943**	**191,960**

OVERALL LOADING COMPARISON
(million pounds per year)

	CBP Calibration	CBP Allocation	Draft Strategy		MDE Calibration	MDE Possible TMDL
PS TN	10.59	4.97	3.72		10.59	3.73
PS TP	0.39	0.29	0.20		0.39	0.19
NPS TN	3.50	2.34	2.76		2.50	1.68
NPS TP	0.45	0.30	0.33		0.15	0.10
Total TN	14.09	7.32	6.47		13.10	5.41
Total TP	0.85	0.58	0.53		0.54	0.29

P.S.
NPS baseline loads are different for MDE's possible TMDL and CBP allocation
or Tributary Strategy model runs